

The Extended Museum:

Production and Design of the *Harold Tovish: Sculptor*
and *Eadweard Muybridge: Motion Studies* Videodiscs

by

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Submitted to Media Arts and Sciences Section on February 15, 1989
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Abstract

Art museums have always been educating institutions. The meaning of this concept has changed over time and increasingly has come to include use of media both within the museum and beyond the museum walls. Interactive videodisc is a form of publication which can significantly enhance the museum experience by making the art and the artist more accessible both to those who work with museum collections and to those who wish to learn and teach about the art experience.

This thesis consists of a paper and a videotape copy of the two videodiscs I produced, *Harold Tovish: Sculptor* and *Eadweard Muybridge: Motion Studies*. The paper will discuss traditional and new media methods for making art accessible both within the museum environment and outside the museum walls as well as the design and production of the two videodisc projects which were incorporated as elements in specific museum exhibitions. Included are explanations of how and why the videodiscs were designed and produced in their present form, how they can act as models, and a description of how they functioned in a specific museum context.

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1. Making art accessible

1.1. Introduction

The art museum is a constantly evolving institution. The responsibilities of these museums have changed as the people who run them interpret the needs and desires of the people who use them. Museums must take care of the work they have in their collections, expand and elaborate their collections under the guidance of their curators, increase the understanding of these collections, and exhibit them and make them accessible in a myriad of different ways. The development of computer systems which link visual and reference databases with interactive accessing strategies is having an increasingly profound role in the art museum's evolution.

Museum exhibitions are the places where people make contact with the work itself. Exhibitions also communicate the point of view or vision of the people who put it together. Museums regard exhibitions as their primary way of making work available to the visitor and design exhibitions to foster appreciation and education in audiences with widely different levels of understanding. The difficulties that most people have in experiencing art are well known to museum staff and much is done to make the process easier (Newsome). The juxtapositions and connections within the history of art are complex. Museums must educate their visitors, a range of users from the art neophyte to the accomplished art scholar. Making a work viewable does not necessarily make it accessible to all. Just as installation can lead to far greater appreciation of the work so can ancillary materials.

Museum staff have practiced a variety of curatorial and collections management techniques to properly manage and exhibit the objects in their care. Issues of access to museum collections often must be weighed against concerns for an object's condition. These dual concerns determine many aspects of museum operation. Museums are implementing programs to more efficiently care for their works than was possible in the past. The exigencies of the treatment of works have increased dramatically in the last decades as knowledge of conservation, exhibition, transportation and environmental practices for works of art have grown. In a few museums computers and databases have been key components in

systematizing collections management. Many more museums are beginning to plan programs for implementing computerization. In institutions which have undertaken computerization the important data on each object can now be kept and easily accessed. One very important result of computerized records has been the adoption of more universal nomenclature for identification and classification of objects of all kinds. This has far reaching consequences for scholarship because much of the confusion arising from differences in classifying art objects can be eliminated.

The world of the museum, however, is not limited only to the exhibition galleries. As collections management techniques make information about a greater number of works more widely available, the idea of the extended museum becomes much richer. Museums do research, help the research of others and broaden people's understanding not only by their exhibitions but by their publications, lectures and other public programs. Reconciling the dual concerns of access and conservation does not have to be as limiting as at first this might appear. Information can be a visual reproduction of the work. Through books, slides, published reproductions of art work, films, and television, many people come in contact with museum collections.

Changes in technology make the extended museum concept increasingly viable and have a discernable impact on museum culture and exhibitions. At present, museums are using slides, film and video presentations, and computers to tie together interactive combinations of these media. It is the quality of this contact and experience which is most directly impacted by changing technologies and central to the extended museum concept. The task of producing media and designing for interactive museum environments presents some complex problems. Design parameters must include attention to details and issues of present environments both within and outside museum walls. The museum must remain committed to its original mission of preserving the experience of the original work of art and at the same time use the power of available technology to make the art experience as meaningful as possible.

This paper is a record of the merging of three strands of experience: filmmaking, curatorial work and experimentation with interactive media. During the past twenty years, I have made documentaries about artists,

many of which have been shown as components of museum exhibitions. For the past ten years I also have been a curator at the Addison Gallery of American Art. I implemented computerization of the museum collections during the past five years along with developing a visual database for inclusion on an optical videodisc of the collections. The evolution of my work as a curator and filmmaker at the Addison reflects my experience in using technology to make all art more accessible. This paper describes one aspect of the evolution of that work, two interactive videodiscs associated with otherwise traditional Addison exhibitions. I start by detailing developments in the museum world during the last ten years which set the stage for use of interactive media to extend the museum walls and the very concept of the art museum.

1.2. Role of the museum as educator: a history of museums and media

Art museums have in fact continually been educating institutions, but the meaning of this concept has changed over time. An eighteenth century European invention instituted in America in the later part of the nineteenth, museums have always viewed as their main function conveying the primary experience of works of art for view by all who enter the museum. Basically this is a democratic ideal of availability to all and grows out of a belief that contact with real art objects benefits individuals and society.

Art museums teach by making works they house accessible. Although approaches vary depending on a particular museum's philosophical orientation and perception of purpose, there is some agreement on the categories necessary for identifying art objects and on the importance of placement of works within an exhibition. In the past few decades the contextualizations of exhibition design and layout have been used as bridges to areas of social science, political and cultural history. In exhibition design an effort is usually made to enhance the viewer's experience of being with the actual art work, but design sometimes in actuality has more to do with crowd control than with facilitating appreciation.

Increasingly, because many museums are finding that it is not enough to simply display objects, museums are working to develop new

materials which make art more understandable to viewers. Contemporary art collections often present the most difficulty for viewers. Each art museum has an audience with disparate backgrounds and knowledge of what they are confronted with when in a museum. The viewer groups vary greatly for each museum based on factors of location, museum collections, purpose, and perception of who the museum considers its audience. Ways of reaching an audience such as lectures, gallery talks, labels and explanatory text are often customized for particular groups, as for example when docents are specifically trained to guide school groups. Unfortunately these educational approaches are usually either very generalized in relation to content or are relatively limited in audience. Critics also charge that too much labeling or explanation inhibits viewers from looking at the art works.

Secondary media to support the primary experience of a work of art has undergone a gradual development over time. Over the last thirty years in particular, the museum experience has increasingly included media. Museum media producers and the curators make satisfying programs which target the broad spectrum of an audience and occasionally they produce programs for specific groups. Slide shows, films and video tapes, and audio recordings are regularly produced and integrated into museum exhibitions (Stein). For example, at any so-called blockbuster exhibition roughly half of the people going through the exhibit have an audio guide playing in their ears. In their interactions with these kinds of media visitors are passive, their choice being only to watch or listen.

As museum audiences grow, there has been justifiable concern that media might corrupt and trivialize the primary experience of art. Too often people may be enamored with a presentation medium just because it uses new technology (Bork) or a program's content and sensitivity may be out of line with an exhibition or an organizer's feeling about art. Media enrich the time spent with the exhibited art when the scope of the program and the needs of the viewer coincide. If properly used, media can play an important role in making available supporting material and works otherwise not physically available because of space limitations, quality or conservation concerns. In the best circumstances, media elucidate works and exhibitions by commentary, comparisons and documentation of the artists, their lives and their art processes.

1.3. Collections management: evolving with changing technology

Keeping track of museum collections has become an increasingly difficult task for museums. Traditionally information about each object is kept on a 3" by 5" index card and includes title, artist, medium, date of execution, accession number, location, provenance, loan reports, bibliographical references, subject categories, and conservation and exhibition histories. Sometimes a small reproduction of the work is also included on a card. As the information about each object increases, so do the number of index cards stapled together. In order to implement new exhibitions and publications, curators and other researchers are faced with a meta-task of retrieving and verifying many levels of detail.

Many museums have enlisted the support of computers and specialized databases to keep track of the necessarily large array of data about each object (American Association of Museums). Computerized management tools have many advantages. The information is much easier to access and manipulate. Reduced staff effort and time spent in accessing both data and objects saves money and can also eliminate unnecessary wear and tear on the objects themselves.

Computerized databases have dramatically influenced research and scholarship in art history. The most noteworthy changes are the speed of searching and retrieving information, the possibility of links to other material, and a more standardized system of nomenclature. In the past most museums and the departments within them have had idiosyncratic methods of categorizing and identifying their objects. Often these systems and how they work are known by only one or two individuals. Over the last few years standardized subject and nomenclature lists have been created in a number of art areas. When added to museum databases, this standardization makes easier, more open and more universal tools for researching and for learning about art. This is especially true for a researcher working in a number of different museums. A well designed system, however, will still allow individuals to personalize the system based on their particular needs.

As yet no more than a handful of museums have attached visual records to their databases even though linked visual and text databases

clearly enhance collections management design. Many museum staff understand the possibilities of visual references either linked or as part of their database. Most, however, have stayed away from implementation because of the expense involved in creating and storing visual records and the lack of standardization and easy use.

1.4. "Museums without Walls": traditional methods and new media methods

New technologies have traditionally addressed the needs of both the curatorial and public functions of art museums. Until the middle of the nineteenth century, engravings and etchings publicized art objects which were otherwise seen by only a few viewers. The invention of photography made possible even wider and less expensive distribution. André Malraux writing in 1967 summarized the situation created by printed publication of museum holdings in his book *Museums Without Walls*. This museum without walls can show us simultaneously in reproduction an artist's work or a style in its entirety. Through reproduction, the viewer has universal access to most of the great works in the world (Malraux).

Malraux's observations on the revolutionary significance of worldwide accessibility to all museum collections were an appraisal of events which had been occurring for years. Museums were publishing more and more reproductions of their works in books, catalogues, postcards and posters and with color and detail often close to that of the original work. This large amount of publishing in conjunction with production of vast numbers of color slides and black and white photographic prints (slides used primarily for lectures in schools and colleges, black and whites used by curators) meant that many people in diverse locations could access an ever increasing range of objects. One no longer had to go to a museum to see a particular work. With reproduction, accessibility to art was more democratic although sometimes difficult because of a limited publication run or a lack of consistent reference methods. This is not to equate the experience of seeing a reproduction and seeing an actual work. A viewer's experience is influenced by the context of a published work just as a work is changed within the context of an exhibition.

Today many of the films, filmstrips, slide shows and video made to accompany exhibitions are released beyond the museum walls as films or videos, television broadcasts or materials distributed to schools. In addition to exhibition materials, museums and outside producers such as publishing companies release material for an increasingly hungry market eager to learn about art. In the climate of post-World War II education, generations of college-educated museum goers are schooled well beyond the required college art history course and many students have rewarding art experiences in the K-12 years. This increased interest leads not only to increased museum attendance but to a genuine desire on the part of many to learn more about art. This desire has spawned a great number of media productions about collections, artists, periods and all manner of artistic styles (American Association of Museums).

In the context of this increased production of secondary educational materials to help their ever increasing audiences understand more about art, many museum professionals are worried about dilution of the primary experience of art that has traditionally been the mission of the museum. These worries take the form both of listing the technical limitations of new media and of broader philosophical objections. Critics of media argue that meaning is often misrepresented. For example, the experience of looking at a reproduction which has poor color, focus, detail, scale or dimension is very different than looking at the original work. Nor do increased production budgets necessarily improve technical quality to an acceptable level.

The philosophical argument can take a number of forms but generally focuses on learning about art from art as each individual chooses. Critics are distrustful of media made for general audiences or media which present difficulty in access to specifically requested information. Examples of the choices a viewer makes when going through a museum include what to look at, in what order, and for what period of time. The curators make the selection for the museum walls; the visitor reorders and selects from that.

In the context of these objections, media technology combined with the accessing power of the computer is being enlisted to answer some of the lingering objections and to provide smoother functioning of museum operations. The combination of visual database with information database

has implications for the museum visitor, art researcher and all of the museum departments from curatorial to shipping.

As costs come down, the new computerized collections management tools will become more prevalent. On the one hand, these tools will allow the traditional staff to better manage their resources. They can work to build universal databases of images and give proper care of the works themselves. On the other hand high quality images displayed on easy to use interactive workstations will allow visitors to perform tasks which used to be the province solely of the curator (Honan). Everyone will have access to museum collections as they wish to experience them. Helped by the sophisticated accessing tools of the computer interface visitors will be able to find what they want on demand. Hypertext capabilities will allow access to the supporting text-based material. Films and videos about art will also be available and programmed with accessing tools so the parts of each which are most useful will be available to the user.

The changes brought about in museum operations by media and computer technology are going to occur in a society which will be affected at all levels. David Bearman describes one example which he claims will be as radical as the change from the oral to written tradition. In the future access to information will change to include multi-sensory documents that include sound, image, text and data (Honan). If the transformation of culture is going to be that marked then the need to understand the exact implications of this transformation increases. This paper will focus on the direct implications of interactive media for museums and people who use them.

2. Considerations of Interactive Media Design

2.1. Design and production of interactive media in the art museum environment

Museums have a climate which is increasingly ripe for acceptance of interactive media. As interactive media becomes more attractive, design parameters become increasingly important. Producing for interactive media is expensive, and since many museums are chronically short of funds, production, installation and maintenance of the necessary hardware and software must be cost effective. In developing a design methodology for interactive media, considerations of both the museum environment and the technology are important.

The extended museum is one which first makes the art accessible and then offers access to all of the accompanying and supporting material. Traditional methods which provide secondary experiences of art objects have been limited by quality or ease of finding a reproduction, diverse kinds and level of requested information and difficulty in integrating available resources about art. An easy to use computer driven interactive videodisc with ability to link still frame video, motion video, sync and non sync audio, graphics, animation, databases, text and reference information can resolve some of these limitations. The visual experience of the objects is always available to the user because if such systems are designed properly the text data and the visual are always linked. Videodisc is presently the only cost effective and workable interactive media available.

Nicholas Negroponte, certainly one of the pioneers in the creation of schemes for interactive media, stated in 1979 that "a new breed of artist" is needed to create interactive media (Negroponte). His statement speaks both to the lack of models for good interactive media production and to the many different skills which must be combined in such production. Steve Gano described electronic books, his analogy for interactive videodisc, as not just a design specification but an attitude for designers and a way to conceive of an information system as a powerful metaphor for making a complex computational environment accessible to inexperienced users (Gano).

My terminology for what is occurring with the increasing availability of interactive media is "value-added video." This phrase is best described by a few examples. The annotations of scholars working with a visual

database will be added to the database. The exhibition installation, complete with diagrams, images and references, can be stored for every show exhibiting an individual work. The history of how a user interacts with a system along with a user profile can be stored and analyzed to help the system "intelligently" assist new users. All these examples demonstrate how interactive media systems will dynamically grow as processors of interconnected information networks.

To best design for interactive media, there are certain aspects of production which should be considered. The delivery of information and programming to staff, visitors and researchers should be of high quality in all aspects: visual distinctiveness, understandable user interface, ability to serve the user's many different needs and levels of learning, transportability to other museum and learning environments and ability to be integrated with coming changes and new uses of technology.

A design paradigm based on these ideas and with special attention to the museum environment can be divided into the production of the presently available delivery vehicle of videodisc and the computer interface. What follows is a short discussion of some of these principles

2.2. Production aspects

2.2.1. Shooting the artwork

The presentation of the artwork must be at the highest attainable level within the technical constraints of the presentation medium but at an affordable cost. In shooting still frame image and motion sequences both the technical and the interpretative facets of photography must be understood. Consistent color quality and sharp detail in the material will bring the best possible results when transferred to videotape. Knowing the exact process and kind of equipment used in the video mastering aides in choosing which film stock to use for acceptable contrast, color and detail. In motion sequences of the art every effort should be made to maximize sharp and steady still frame viewing, one of the reasons for using videodisc. If budget and copyright restrictions permit works should be photographed in ways which utilize features particularly appropriate for videodisc, as for example in photographing multiple views of a sculpture.

Making a photographic interpretation of a work of art for videodisc raises all of the traditional concerns of making reproductions but with some added problems and advantages. A good photograph combines the sensibilities of a photographer and the curator in the representation of the work (Lee 1986). A satisfying image must have correct color, contrast and lighting, scale, modeling, viewing position and detail. Museums try to pay attention to these parameters and constantly work to improve methods for photographing art. They know that the photograph (or reproduction) is often the only way a work will be seen.

Videodisc is limited by the low resolution of the television medium so every effort must be made to optimize picture quality. For example photographing objects against a ground which is as neutral as possible keeps a consistent background from frame to frame and best shows the objects. In photographing for videodisc, the relationship of the art object and the aspect ratio of the television screen must be considered since very few art objects have the same height/width ratio as television. The masked borders of an object seen on a television monitor are an important design element.

Videodisc has an advantage of enormous capacity for still frame storage which allows space on the videodisc for many different interpretations of a work. A work can be seen from different viewpoints and in different kinds of light. All the pertinent details, so necessary in videodisc because of the low resolution, can be included. The problem of conveying scale can be dealt with by including photographs with measurement references. In photographing work specifically for the videodisc copyright problems, staff shortages and financial constraints often limit the number of views of a work included in a visual database. Space limitations of videodisc are also a consideration even though 54,000 frames on one side of a CAV videodisc translates into a large number of individual photographs. When motion sequences are added at 30 frames per second, space is allocated much more quickly (Naimark).

In motion sequences of art objects a number of additional points specific to videodisc should be noted. Videodisc can be played back in slow motion which allows for a "moviemapping" approach. Pioneered by the work of the Aspen project at M.I.T., this method looks at something not by shooting continuous footage but rather by taking each frame at a precise

time or longer than the normal 24 or 30 frames per second interval. The series of shots are made to appear continuous when they are played back at a slower speed than normal. This method gives the appearance of real motion. The John Paul Getty Museum used this approach with highly satisfactory results to look at a series of vases on videodisc (Binder). Viewing of their videodisc produces the appearance of looking at a work in real time but without taking an enormous amount of the space on the videodisc. At times it makes sense to shoot objects in real time when there is reason to include a synchronous audio track or when the shot will be part of a "narrative movie."

Using videodisc it is possible to show many lesser works, preparatory drawings, inscription details and other visual references which are rarely seen by anyone but museum curators. The material available in reproduction from most museums is more often than not limited to work which is popular for one reason or another. The published impression of art history is skewed because there is so little published knowledge of some media such as drawing, or of lesser known artists and periods. The encyclopedic availability of art, made possible by visual databases videodisc allows, will enrich the interpretations and understanding of art by making more works accessible to a wider audience.

Visual databases are expensive to produce due to both costs of labor and materials. As a cost-cutting strategy, it is important to make archival masters which have lasting color and high resolution so that they can easily be transferable to new technologies. The *National Gallery of Art* videodisc, the most popular of the videodiscs published about art, recorded the still-frame section directly from 8"x 10" transparencies to the NTSC video master (Whiteley). When the videodisc was released in 1983 this was considered the way to achieve the best image quality. If the publisher decided to release a higher resolution version they would need to go back and reshoot the 8"x 10" transparencies, at considerable expense, in order to release in the higher image quality format. Today's technology allows for a high resolution film master which has future use in higher resolution formats and produces the best quality results in formats currently in use.

Future digital image storage technologies will have the capability to save a single data file of each image frame. In future working environments this data will be accessed according to needs specified by the

application and produced in forms tailored to needs of publication, collections management or museum education and research.

2.2.2. Making films for interactive media

The creation of motion sections for interactive videodisc is different from non-videodisc filmmaking because the material can be accessed in a non-linear way. The style and aesthetics of videodisc production are interdependent with computer interface considerations. For example, in producing an interactive documentary movie one has to observe different sets of artistic criteria and stylistic limitations than in producing a documentary meant to be seen from beginning to end. This is not to say one can throw away other filmmaking conventions. For example, a good movie still must have strong camera work, clear and complimentary audio tracks, and an understandable and creative approach to the material and the audience.

The design of the computer interface together with the technical capabilities of a particular videodisc configuration must be taken into account when making motion sequences. A two disc playback situation allows seamless edits as the user chooses and views sequences. A one disc playback system has a blank screen when the videodisc player track jumps from shot to shot. Using visual or audio dissolves to bridge sequence transitions may be smooth and lyrical in a linear film but may not make sense for interactive access if the desired point cuts to the middle of a transition. The composition of individual shots in a sequence are also influenced by modes of display as for example when they are shown in windows on a graphics overlay system.

If the final production includes a visual database shots of the artwork, these need not be included in the body of the film because they can be stored in a visual database of images on the videodisc or in digital memory if the system has that capacity. Audio too can exist either digitally or on a separate computer driven device such as compact disc.

The amount of interactivity will govern the granularity of both the film material and the database. In the context of filmmaking, "granularity" describes the smallest size of building blocks which the viewer can access (Lippman 1989). Granularity must be considered in

designing and editing videodisc material. The sophistication of the interface will govern the manner in which viewers are able to make their own movies. Negroponte's concept of "the audience of one" is a good metaphor for this interactivity (Negroponte). In allowing personalized decisions in movies one has to decide whether to allow construction of a movie on the shot, sequence or general subject level. Everyone does not have the filmmaker's knowledge necessary to make an understandable film. In a filmmaking of personalized contents, however, the knowledge of the filmmaker may have more to do with the work of a database and a computer creating a final vision of the material in concert with the user (Lippman 1980).

The style of a film will have a great deal to do with how it can be "reconfigured" (Sasnett). This aesthetic principle has ramifications for filmmaking. Filmmaking becomes more of a primary experience, the technical process of which people can learn for themselves. The user can rearrange the chunks of information and change the original bias of the material by arranging it to create rhythms and intentions different from those of the filmmaker. The way material is arranged on the videodisc becomes increasingly important as different classes of information present problems in creating aesthetic wholes (Mark).

In editing the material both the initial viewing environment for a videodisc and projections reconfigured for later use must be considered. Some museums are using videodisc primarily because of its ease of playback. Videodisc players do not break down as often as videotape players and can offer a viewer a choice of short movies (Cash). If design considerations call for a computer interface, material can be used in a manner very different from a situation where access is by way of a chooser mechanism. For example if a museum anticipates a big audience for an exhibition, both the type of installation and the movie are influenced by these considerations.

In a more personalized installation both artistic and technical process material which ordinarily may not fit within a linear film can be included. Sections of the videodisc can exist as parts aesthetically separate from each other. They may not, in fact, even be parts of the same movie. As future learning environments become enriched by more available interactive media, information may exist separately or as part of other

information such as graphics, animation and still frame illustrations held in a system's digital memory.

2.2.3. Interface considerations: the extended museum

The museum environment itself influences interface design just as it influences how the material is edited. The purpose of an interactive interface is a primary design consideration which must not be forgotten. People who are shy about asking questions in a person to person situation can often benefit from the patience of a machine which encourages asking and exploration at one's own speed (Cash). Technology's fast access can put a user in many situations, but some may be wrong either for reasons relating to the exhibition or the skills of the user. If enhancing the experience of art is one of the principle reasons for using secondary media, it is important to not alienate your audience by the technology.

An interface should provide easy access and necessary clues for clear navigation through levels and menu selections. To do this, there must be a self-evident structure of where you are, where you have been, and where you are going. Jim Hoekema who has been designing interactive systems for ten years describes the interface as a set of generic principles which must be "organic" like the theory of architecture defined by Frank Lloyd Wright. His concept calls for a design which creates "a good servant": capable, unobtrusive, considerate, respectful, courteous, economical, and with clarity of communication (Hoekema).

The Archfile project done at the M.I.T. Architecture Machine Group in the early 1980's was an early model for this approach to art-based imagery was. By means of a touch-screen sensitive interface, 5,500 architecture images could be accessed on videodisc. Particularly well designed graphic overlays guide the user through a hierarchy of choices; building type, designer, location, period or any combination of these parameters. The design was built around folders within files which could easily be rearranged and searched for the pictures a user wished to view (Purcell). Today there are a number of hardware and software platforms which could support such an easy to use system, but at the time the project was available only within the laboratory.

In designing you have to decide who your prime audience or user is going to be because no interactive program can serve a first-time user and experienced one equally well. For most museum installations it makes sense to optimize for first time use. This will certainly change as museum audiences become increasingly familiar with computers and interactive media. Computer interfaces for videodisc can be either specialized for a particular audience or generic enough for use with several videodiscs. Perception of audience also plays an important part in deciding on screen design. For example, if a videodisc is designed for a number of audiences, the screen design and graphical overlays must reflect this decision.

The power and speed of the computer system will also make a difference in videodisc interface design for use both within the museum environment and outside the museum walls. A museum may have an installed computer system used for day to day operations and the videodisc may need to interface with this particular system if information is to be managed across all of the museum's functions. For use outside the museum, an interface may need portability to provide links and accessibility across different networks and systems. This is a job for programmers working in conjunction with curators and educators in fields such as libraries, schools and industry. What follows are detailed descriptions of how the preceding principles were carried out in the production of two videodisc projects, *Harold Tovish: Sculptor* and *Eadweard Muybridge: Motion Studies*. Both illustrate the complexities of designing videodisc for a museum environment.

3. Eadweard Muybridge: Motion Studies videodisc

3.1. Introduction: Addison Gallery 1984-1988

In 1984 the Addison Gallery of American Art purchased at auction a complete set of Eadweard Muybridge's *Animal Locomotion*, the motion study work done under the sponsorship of the University of Pennsylvania in Philadelphia from 1883 to 1885. The eleven leather-bound volumes published in 1887 contained all but two of the 781 plates.[†] The plates were in excellent condition but the bindings were dry, cracked and starting to turn to powder. The museum's conservators decided to unbind the plates and wash and deacidify them in preparation for a scheduled fall 1987 exhibit to commemorate the 100 year anniversary of the book's publication.

The Addison Gallery has strong holdings in late nineteenth century painting and an extensive photography collection. Staff based their decision to acquire *Animal Locomotion* on the opinion that this important achievement in 19th century photography was a valuable addition to the photography collection and an ideal compliment to the painting collection, particularly the paintings of Thomas Eakins and Winslow Homer. Art historians consider Muybridge's opus in the study of human and animal motion of importance in the invention of the apparatus to produce motion pictures, the direct and scientific study of motion, serial image-making (a prevalent thread throughout twentieth century art) and an orientation of observing "life" as the subject of art. (Hendricks)

While planning the Muybridge exhibit the museum was actively seeking to purchase but as yet did not own a copy of Muybridge's early motion study, *Attitudes of Animals in Motion*, the landmark work which for the first time stopped motion in an analytical way thereby demonstrating exactly how horses did run.[†] Only six complete sets of this much rarer album of albumen photographs are known to exist. Fortunately, an album was purchased one year prior to the exhibit. *Attitudes of Animals in Motion* (Fig. 1) and the photo-mechanically printed

[†]Each of the approximately 100 bound sets were assembled by hand so often mistakes were made in including all of the 781 plates Muybridge had produced. The Addison Gallery set had two duplicate plates.

[†]*Attitudes* was a compilation album, 171 plates, of all the work Muybridge had done in California from 1872 to 1879 under the sponsorship of Leland Stanford.

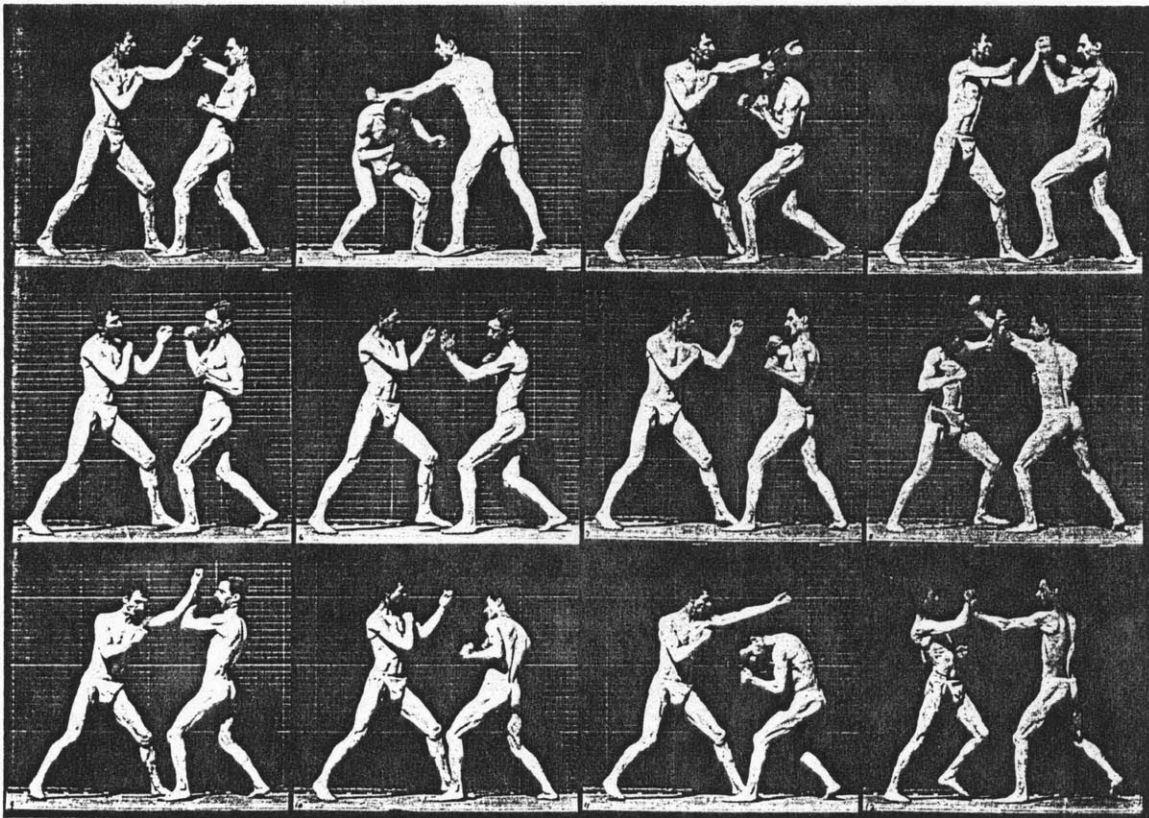
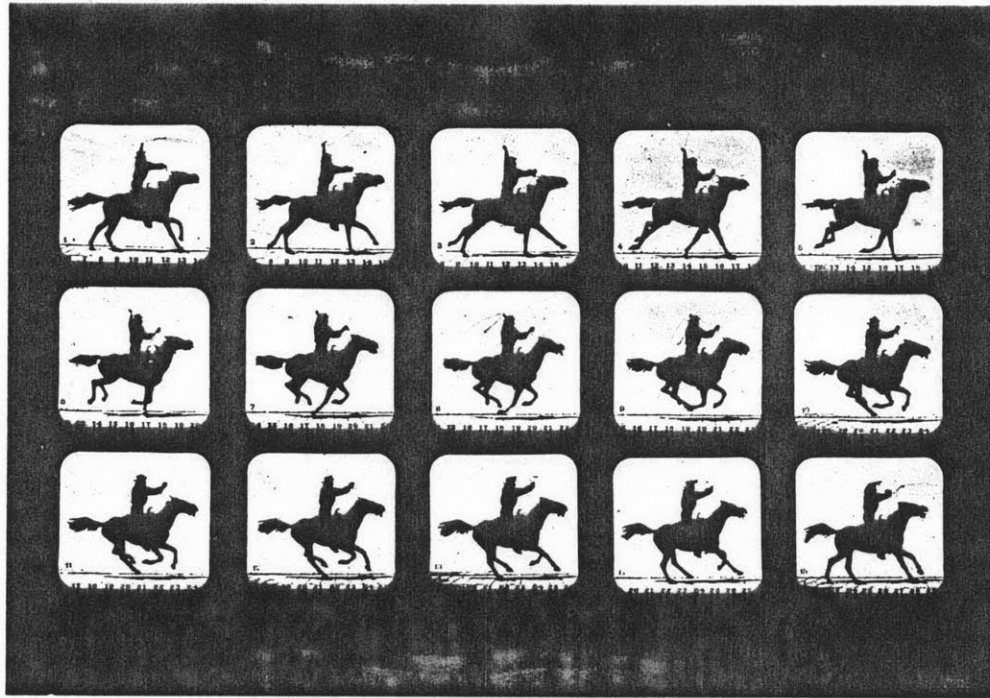


Fig. 1 (above) 'Vaquero and Rialto', plate 60, from Eadweard Muybridge, "Attitudes of Animals in Motion", 1881, albumen print, 6 1/4 x 8 3/4"

Fig. 2 (below) 'Boxing, open hand', plate 336, from Eadweard Muybridge, "Animal Locomotion", 1887, collotype print, 9 x 12 1/2"

collotypes of *Animal Locomotion*, (Fig. 2) provide a complete view of Muybridge's motion studies.

During the period of time 1984-1989, the museum staff also has been actively involved in photographing on 35mm color slide film all of the 9000 objects in the museum collections in preparation for doing an optical videodisc and using IBM-PC compatible computers to simultaneously enter information about each object in the collections database. Initially the museum planned to use these computers to interface the videodisc with the database.

3.2. Eadweard Muybridge exhibition plans

In the spring of the year 1872, while the author was directing the photographic surveys of the United States Government on the Pacific Coast, there was revived in the city of San Francisco a controversy in regard to animal locomotion, which we may infer, on the authority of Plato was warmly argued by the ancient Egyptians, and which probably had its origin in the studio of the primitive artist when he submitted to a group of critical friends his first etching of a mammoth crushing through the forest, or of a reindeer grazing on the plains.

In this modern instance, the principle subject of dispute was the possibility of a horse, while trotting - even at the height of his speed - having all four of his feet, at any portion of his stride, simultaneously free from contact with the ground.

The attention of the author was directed to this controversy, and he immediately resolved to attempt its settlement. (Muybridge)

Muybridge is often seen as one of the inventors of the motion picture. His technical achievements in being able to stop motion at prescribed intervals with precision and clarity were major steps in the invention of motion pictures. The use of flexible film and intermittent shutter projectors pioneered by Thomas Edison and others rendered Muybridge's analytical way of recording motion into the synthetic motion of the motion picture for mass audiences. Little is known of the fact that Muybridge as early as 1879 (Haas) used a device he invented called a zoöapraxtinascopé to project motion sequences at his lectures. Muybridge tried to demonstrate the

variety of the animals, gaits and motions he had captured in his photographs through these moving photographs. In these demonstrations, painted glass discs with copies of his photographs were spun in one direction while a slotted disc which acted as a shutter was spun on the same axis in the opposite direction. These images produced a perception of motion when illuminated by gaslight from behind and focused by a lens in front of the two discs. For these lectures Muybridge chose sequences with what he called "circular movement." The projected motion appeared to go continuously illustrating one or more recurring acts of motion (Muybridge). During the next 14 years Muybridge incorporated his later Philadelphia work into his projected motion demonstrations. During the 1893 Columbian Exposition in Chicago, Muybridge had a building where he lectured and projected his motion studies (Moseley). In 1894 the introduction of Thomas Edison's Bioscope projector effectively ended any popular interest in Muybridge's work.

The scope of Muybridge's work as a documentarian, a filmmaker, a sociologist and "artist's truth renderer" had to be shown for the museum exhibition through careful choice from his almost 1000 plates. Muybridge chronicled all aspects of a horse's movement, many wild and domestic animals and all manner of athletic, working and everyday motions of men, women and children. He consulted with artists so as to take sequences which would be most helpful in allowing artists to draw movement correctly. He directed some of the sequences and observed others, both modes of what we today think of as the narrative and documentary styles. He was the first film director and the first film documentarian whose use of multiple camera views, close-ups, zoom-ins and outs and tracking shots all became standard cinematic conventions in the making of film.

Originally the museum planned to exhibit all the motion study plates. However, even if the plates were hung in double rows, this would take all of the wall space in the museum with only an inch between each plate. As the curator of the show, I decided not to proceed with this plan for three reasons. First, many of the plates are repetitious in content. Second, showing all the plates would leave little space to show Muybridge's earlier work as a landscape photographer and the apparatus and artifacts loaned to the exhibition. Finally since *Attitudes of Animals in Motion* is complete and in perfect condition, I decided against splitting it. Although all of the

Muybridge plates could not be shown in actuality they could in either the film or video medium. It was also clear that an animation of at least some of the plates was necessary to make the true nature of Muybridge's motion work comprehensible.

As a curator, I was interested in Muybridge work, but I also was drawn personally to this man's work. As a filmmaker I was well aware of Muybridge's relation to the origins of filmmaking. Muybridge foreshadowed documentary film's ability to open our eyes to worlds available to us but which for one reason or another we had not seen (Barnouw). Muybridge bridged art and technology. The plates themselves were extraordinary, but Muybridge also brought his models to life. I had seen some plates animated but was convinced that videodisc rather than an animated movie would keep both the beauty of the plates and their character as animated sequences. Viewers could see any aspect of Muybridge's work they chose and analyze the work in ways not possible with film or video. They could either have an analytical view of Muybridge's work through a frame by frame viewing or a synthetic view of real motion which Muybridge was close to perfecting.

Videodisc seemed the perfect vehicle for Muybridge's work, but the collections videodisc would not be done in time to show a Muybridge section as part of the planned exhibition. The museum decided to produce a separate Muybridge videodisc both for inclusion in the exhibition and for future distribution. A videodisc devoted just to Muybridge's motion study work by a museum which owned all the Muybridge motion studies seemed fitting for the 100 year publication anniversary.

The following time line summarizes museum activities between 1984 and 1989:

- 1984 - *Animal Locomotion* purchased
 planning started for the collections videodisc and database
- 1985 - collections inventory and photography started
- 1986 - *Attitudes* purchased
 collections database designed and data entry started
- 1987 - Muybridge photography, database and computer interface
 accomplished
 Muybridge exhibition opens in October.
- 1988 - collections photography completed.

1989 - (planned) collections database entry finished, collections
videodisc finished

3.3. Initial design and production considerations

There were a number of key issues in the design of the Muybridge videodisc: selection, Muybridge's intent, quality, exhibition constraints, costs, future distribution, and reference for future research.

To show the Muybridge work in a contemporary exhibition and be inclusive necessitated putting all of the plates from both volumes on to the videodisc in a manner similar to the original volumes. In addition an animation which kept the "intentionality" of Muybridge's own projections had to be fashioned into a complete piece which could be seen in its entirety or studied on a sequence by sequence basis. Both *Attitudes of Animals* and *Animal Locomotion* were put on the videodisc so as to maintain the book format of the original. All elements were arranged in the same order as in the original volumes (title blocks on the covers, title pages and photographs of the volumes and the plates themselves).

The computer interface could order everything properly regardless of position but ordering the material meant that the videodisc would be true to the book format in a level I configuration. The videodisc had to be produced for level III use in the museum installation but for release after the exhibition it had to be usable in both a level I and level III configuration. If the images were put on in book order viewers could use a step or slow command to look at the material in both a level I and level III configuration just as they would the original material (Naimark).

A second section of the videodisc and a complete entity unto itself presented video sequences which were my creation and view of Muybridge's work. I felt this section should be silent as the original material was certainly silent. It would include sequences which were key to all the important areas of Muybridge's research and creations. For this section, I chose to animate 140 plates. Each camera viewpoint of each plate was shown repetitiously for approximately five seconds so the viewer could both contemplate individual plates and perceive motion. Each animated sequence had to be able to hold the the audience's attention during the 18

minute sequence. This method is similar to Muybridge's own demonstrations in which each plate was shown for a short period of time.

Particular attention was paid to the requirement that the videodisc be installed within the exhibition and be viewable by a maximum audience of 35 people (the limit on the number of people in the gallery where it would be situated). The installation would encourage interaction on the part of the visitor but not for too long because there would be only one videodisc workstation. Any long use by one visitor would deny the other visitors who were coming through the exhibit at the same time the chance to see the long animation sequences which I judged key to understanding Muybridge's work. Longer than 20 minutes was also too long for most museum visitors. Our observations prior to the Muybridge exhibit showed that most visitors stayed at the museum for slightly under an hour. Viewing the exhibition and any video or slide program should fit within this time frame: 30 minutes for viewing the exhibitions, 20 minutes for the video, 10 minutes for coming, going, and perhaps a stop at the museum shop.

These sequences also had to be viewable on a frame by frame basis for study of individual plates. This was possible in the exhibition but with limitations. The interaction time for each visitor had to be short. For later use in classrooms, art studios, other museums, design, video and animation studios full and complete access to the smallest element of Muybridge's work, the individual shot, was required at the highest possible resolution. The myriad uses foreseen for study and for incorporation into other work would warrant high quality input to digitizers, networked workstations, printers, and add the value back many times later.

The individual frames of the animations were placed directly after the plates. If all frequently searched frames are stored in proximity on the videodisc, the length of time it takes for a computer to access a particular frame decreases. The long animations accessed most frequently from beginning to end as one play were placed in the space remaining after the individual frames and plates. This design insured that the videodisc would be usable with a printed index at a level I configuration while optimizing access times at level III.

Today one side of a CAV videodisc holds 30 minutes of normal play video. Even though the Muybridge layout only used 22 minutes of a 30

minute videodisc, the nature of both the material and the constraints of museum considerations reinforced decisions not to include any additional material. As an artistic decision the choice of plates and the number of times they were cycled through seemed to work. Anything more would be redundant. No documentary or commentary video material was added because the videodisc was intended as a source of the original material.

All of the plates and the animations were shot on 35mm film stock to create a master at a level of quality which could be used as a master for any of the coming high resolution formats during the next 20 years (CD-I, DVI, digital, high definition TV). From this film master, a video master for the videodisc could be made at the highest standards of present day NTSC video (Naimark). The individual plates were shot on 35mm fine-grain positive still film stock using still cameras. The animation sequences were shot on 35mm fine-grain negative motion picture stock using an animation stand with computerized motion control.

Budgetary and time constraints did not allow us to shoot all of the material using 35mm negative motion picture stock and 35mm motion cameras. Negative stock would have given the greatest control in the film to video transfer. Contrast and highlight definition are more adjustable and greatest coming from a 35mm negative master (Dowdell). The Muybridge still material was shot as 35mm slides. The positive aspects of this choice outweighed any loss of picture quality. Sorting slides for correct order and exposure consistency is easier, cheaper and less time consuming than having to check, splice and reshoot a 35mm film master. The museum had the equipment and personnel to shoot the stills with speed, consistency and control. We also worked with a post-production house capable of high quality film to video transfers of both positive and negative film masters. (See Appendix A)

Muybridge's cameras were placed with relative precision, but because each camera had in fact in a different relative position the animations required compensation to produce a repetitious field of view for each shot. The film was shot one frame of film for each frame of Muybridge's material. This meant in one section of the videodisc a viewer could carefully examine the sequences and analytically view the animations.

To attain the frame to frame match necessary for creating smooth animation we needed to find an animator to shoot the individual frames of the plates for the motion sequences. Since frame matching and cropping is an expensive and time consuming job despite the precise movement given with good equipment, all cropping was done at the transfer stage to save time and money at the filming stage. Electronic cropping is much quicker than mechanically cropping each frame.

The animations were shot at a local animation studio close to the museum. (See Appendix A) They carried out the job with a meticulous attention to the detail that was necessary for the Muybridge material. Their alignment of the frames was accurate so very little adjustment was necessary in the film to tape stage.

I conducted a test with a write-once videodisc and demonstrated that there would be a more natural appearance of motion if the adjustment between Muybridge's average of 10 frames per second timings and the videodisc's normal play speed of 30 frames per second was done in actual real time. This also could have been created by playing the videodisc at 1/3 speed or by shooting approximately three frames of each on film, but by generating the real time video out of the digital frame store I could choose exactly the speed I wanted. Because the normal NTSC video signal is field-interlaced, there appeared to be a dissolve when the field from the previous frame was interlaced with the new field in a frame. This gave the motion a less staccato feeling. It also meant that there was a section which when played from the beginning would be my film, a rendering of my interpretation of Muybridge. This would be accomplished without computer controlled sequencing and available if the Muybridge material was viewed as a level 1 videodisc.

The design of the computer interface had to be simple, easy to use and elegant, work well within the planned exhibition environment and also contain all the basic information necessary for use beyond the exhibition environment. The stills, animations, visual database, and database of text and bibliographical information contain a rich source of material for future research. Within this material there exist an extraordinary number of clues and associations. For example, researchers can still study Muybridge's original assertions about walking by viewing and comparing how all animals walk.

Initial specifications for the computer interface detailed an industrial level videodisc player connected to an IBM-PC compatible computer like those already used in the museum. I considered a two screen system mandatory both for aesthetic reasons and the nature of the Muybridge material. This material was art work not just visual information. The monitor was like another picture on a wall and any windows would be intrusive. Essential communications software and database constructions written at a point three months before the exhibition opened were not polished or elegant and certainly were not bug-free but with a lot of work and the employ of an outside programmer they could be finished. In an IBM-PC based form the Muybridge videodisc would only have general distribution in a level III mode if the entire software package we were writing were packaged with the videodisc. After investigating a number of other commercially available software-hardware packages, I found them to be too expensive, inflexible or system specific. This scenario foiled one of my main goals: the database and videodisc drivers should be generic, relatively cheap, and run on basic systems with no fancy graphics or interface boards.

On August 15, 1987, two months before the exhibition was set to open, Bill Atkinson stepped to the podium in a large hot room at Macworld in Boston. He began a demo by saying, "Here's Hypercard." As I watched him show his "stacks," "buttons" and other assorted tools, I knew I would be able to finish the Muybridge material as I wished. At last here was a hypertext based "erector set" with built in videodisc drivers which could run on a large installed base of machines, was inexpensive, in this case free, did not need additional hardware beyond the computer, videodisc player and monitor, used a two screen system and was easy to program.

3.4. Final design decisions, production, and the computer interface

The advantages of Hypercard were so obvious that I immediately shifted gears. I procured a Macintosh computer, the videodisc cables and little points of information from developers at Apple as well as colleagues around the country who had done some work with the program and videodisc. The exhibition installation was designed and the work of getting the objects on the walls was well under way 45 days before the exhibition was scheduled to open:

all the slides were taken and ordered, the animations shot and the final script for the videodisc completed. However, the transfer of the film to video, the supporting text, wall labels and the software still needed to be finished.

During the first week of September, the film was transferred to video and the video tape was sent off to 3M for disc mastering. I felt that the very best quality in NTSC video had been accomplished. (See Appendix A for a complete technical account of the process.) A video digital master was made as back-up. The film master was put in controlled storage and the material was archived and ready for the technical innovations of the future. I felt like Muybridge was sitting behind us during the entire process and his spirit seemed pleased that we were being true to his material. The video looked like what he would have done given access to the same equipment. Several of my colleagues at the Media Lab in fact often joked about Muybridge being the first to use a moviemapping approach to create motion; designed into his work was the idea of saving space on a videodisc.

Quickly, the parameters of the computer interface were put in place. (See Appendix D for examples of the Hypercard screens.) Even though Hypercard was used, it did not make sense to implement its hypertext and interconnecting abilities because they might keep one visitor at the workstation for an extended length of time. I chose to restrict interaction to use of the mouse because at that point in Hypercard's development there was no way to lock up the program. You could not prevent someone from fooling with the program if they had access to the keyboard. Keyboard functions, intricate search capabilities and large supporting text fields which would take too long to read were all ruled out. The computer was to act as a simple navigator through the work with few levels but a clear and easy to understand interface. Searching capabilities were all programmed directly in with Hypercard buttons, programmable areas started by the mouse. Scripts controlled actions specified by buttons. The interface was extremely simple with a simple branching system. (Fig. 3) The interface used a book metaphor. Choices are similar to selecting chapters and then paging through the located section. At every level there are always directions similar to those in a book's table of contents to tell one what to do and how to return to the top level. Since reading extensive text would tie up the single exhibition workstation for long periods of time, wall labels containing all supporting explanatory and biographical material were mounted in the same room with the videodisc installation.

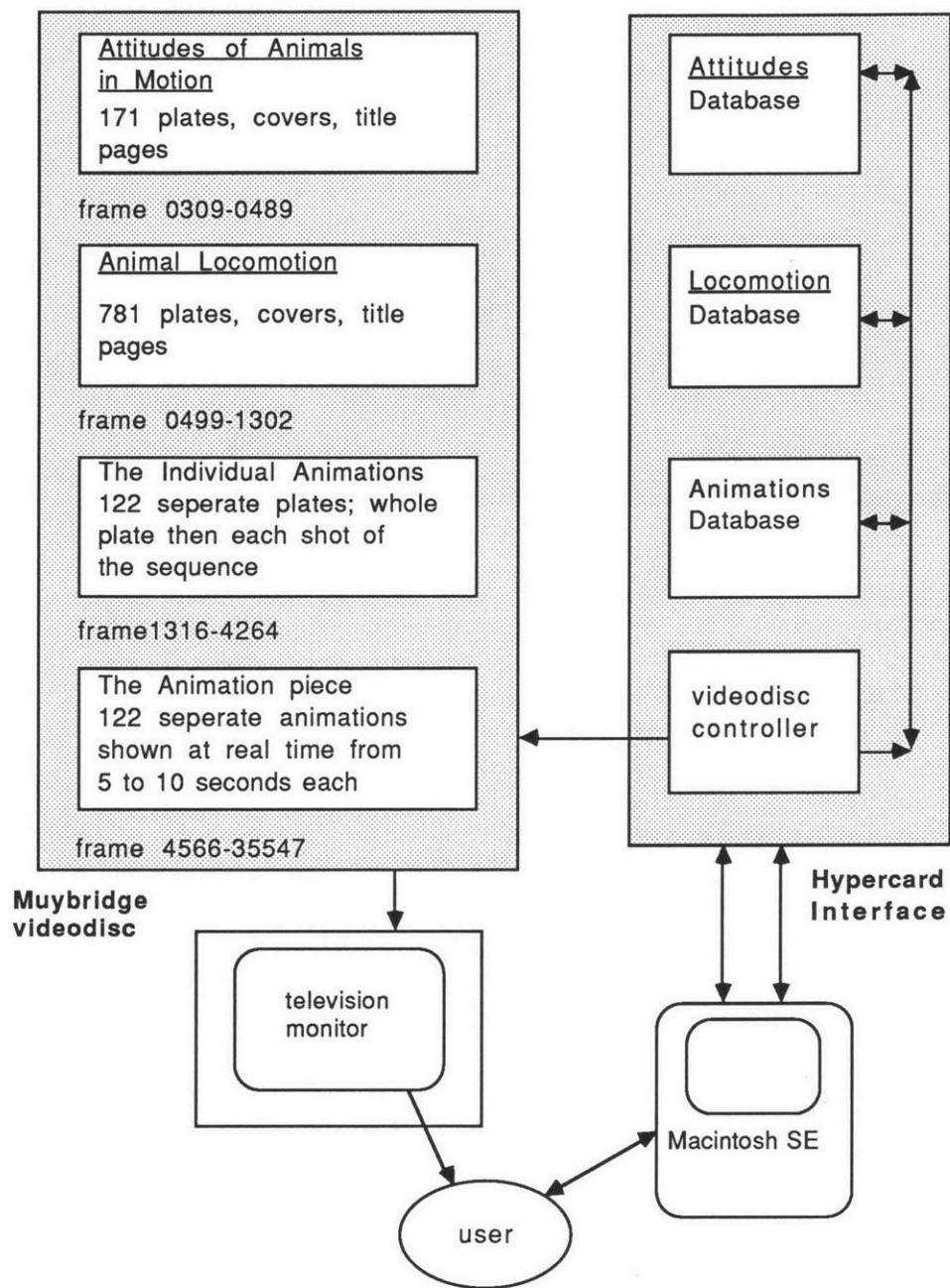


Fig. 3 diagram and frame locations of the *Eadweard Muybridge: Motion Studies* videodisc

3.5. Reactions: what happened when shown

The exhibition opened on October 18, 1987 and occupied 4 galleries at the Addison. (See Appendix E) No equipment or software breakdowns occurred during the two month run. Since the museum staff was unsure what to expect from a videodisc installed within an exhibition, museum guards monitored people using the videodisc. According to their records, after a member of the audience or a guard started the long animation, 80% of the viewers sat or stood for the 18 minutes and then went into the exhibition to look at the exhibited objects. After the animation sequence 20% worked more with the computer and browsed the animations or plates.

The reactions of visitors and reviewers to the videodisc aspect of the exhibition were extremely positive. The most common remarks were "I finally understand what Muybridge was all about" and "It's amazing to see the people and animals come to life." The photography critic of the Boston Globe, Kelly Wise, in his review of the exhibition stated the following.

The video disc is a magical component of the exhibition. Viewers can push a button and study a film of selected sequences or browse through various groups of sequences (for example: men, nude athletes) or browse through the various plates in both Muybridge books. In every case, the figures that are seen in frozen frames and often at conflicting camera angles on the plates are animated in the video. Imagine looking at a flip book. The video simulates what Muybridge must have directed and seen - for instance the actual motion of a woman gracefully turning and passing up a stairs - that could only be recorded on film in discreet fragments. By emphasizing cross-cutting, an occasional closeup, zooming in and out, the video also allows us to make conjectures about Muybridge's studies as a forerunner of silent film.

The Muybridge videodisc was made not only to accompany an exhibition but to be a resource. Requests for copies of the videodisc have been constant ever since its installation. An arrangement has been worked out with a publisher to distribute in the spring of 1989 a level I version videodisc with a printed index to find the locations of the individual plates and animations. A commentary sound track adapted from Muybridge's own lectures and accounts will be added to the animation sequence. An

accompanying Hypercard stack for those who wish to use the videodisc in a level III configuration will also be available. The stack is being enhanced with extensive search capabilities for classes of movements and types of activities. Additionally, sophisticated controller tools will be added for easy navigation. Text material, commentary, biographical notes about Muybridge and the history of the experiments, will be made available as part of the stack. The Muybridge videodisc should be able to become a part of any accessing system which uses videodisc as an input device. Individual and institutions will also be able to use it because of the level I accessibility.

4. Harold Tovish: Sculptor videodisc

4.1. Background of Harold Tovish and the exhibition

In the spring of 1987, Christopher Cook, the Director of the Addison Gallery, and I discussed the possibility of doing an exhibition of work by Harold Tovish. A videodisc component about Tovish and aspects of his work would be included in the exhibition. At this time the museum was actively involved with producing the museum collections and Muybridge videodiscs, but I was also arguing for a videodisc which would have a documentary section. I felt it was important to elaborate the "electronic book" concept and bring in a missing ingredient, the artist himself. We met with Tovish and he agreed that a retrospective exhibition with a printed catalogue and an accompanying videodisc, "whatever that is" (Tovish), would be mounted at the Addison Gallery in the fall of 1988.

Harold Tovish is a sculptor who has lived in Boston since 1957. Originally from New York City, he began to study sculpture in W.P.A. classes in the 1930's, served in WWII and finished his schooling at Columbia University and in Paris after the war. For forty years he has worked as both as a teacher and an artist who exhibited widely in the United States. His work is included in many major museum collections and his name, while not a household word, has considerable reputation in some artistic circles. He has always worked in an expressionist mode and his primary interest in the human figure, particularly the head, connects his work to that of Rodin, Brancusi and Giacometti.

Tovish's style of making art has been considered out of vogue since the 1960's. He, however, has continued to work, exhibit and explore new ways of working. In the mid 1960's he made kinetic sculpture and also began doing installation pieces, a type of work which he continues today. His work is not easy for many people to understand. Yet in his work there is a concern with the human condition and often a political edge. He is an important force in the Boston art world and is a great story-teller. He has been married to another sculptor since both were in art school. Because here is a fascinating man and an important artist, we decided it was important for people to see his work and understand him as an artist.

4.2. Initial design considerations and production

From the beginning of the project there were two main sections to the videodisc: an interactive cinema-verité style documentary about Harold Tovish and a complete visual catalogue of his works. The videodisc presentation would be an integral part of the exhibition. While plans only required that the interactive computer interface give museum visitors access to the videodisc, in actuality the museum staff used the computer to manage all aspects of the Tovish exhibition. While not the main thrust of this discussion, the final positive outcome of using computer management in all aspects of this exhibition clearly reflects ways in which computers are affecting diverse aspects of museum operations

4.2.1. The documentary

The Tovish documentary was planned as cinema-verité. Let Tovish disclose himself to the filmmakers and the audience. As the filming proceeded he would reveal his intentions as an artist, his aspirations and feelings. Tovish did not respond well to probing questions and directed action, and I as a filmmaker was interested in letting him tell his own story. Let the art historians and critics write and comment but let the final videodisc reveal Tovish.

Making the Tovish documentary for videodisc was different than traditional documentary because videodisc is a medium in which the final outcome is not always viewed in a linear manner but in rather in "chunks" (Mark). In the final presentation these chunks are accessed according to levels the database allows. As in the Muybridge exhibit granularity of access for the Tovish material was decided by two factors. Single visitors must not have an opportunity to spend large amounts of time using the videodisc. There also must be some part of the videodisc viewable in a linear fashion, if you will the videodisc needed to provide a granularity within a granularity.

The videodisc was to be installed as part of an exhibition spanning the work of Tovish's entire career, thereby solving the difficult problem of showing art well within documentaries. Typically in documentaries, the film or video moves and the art is still. An art object which is largely static necessitates compromises (usually endless pans, zooms and cuts of the art)

to keep visual interest as a person talks or music on the sound-track while the camera is showing the art. Neither the art nor the artist is served by this approach. Shots of the art interrupt the flow of the visuals of the artist talking, living and working. Camera movements scanning the art create disconcerting feeling about the art because viewers are not able to stop the movement and contemplate the work at their own pace.

The Tovish material was designed for use on either a one or a two disc system. A two disc system allows seamless transitions from one chunk to the next. With a single disc system a black space between documentary chunks is unavoidable. The Tovish documentary footage was cut to use this black frame as a motif, thereby minimizing any discomfort or visual confusion. As with the Muybridge videodisc, I opted for a two screen system to maintain the integrity of the visual material.

4.2.2. Shooting the artwork

Initial plans for the Tovish videodisc included a complete visual catalogue of the artist's work both for use within the exhibition and for future publication. Because Tovish is a sculptor shooting the catalogue for videodisc presented some very interesting possibilities for solving the problem of how to adequately represent a 3-dimensional object in a 2-dimensional medium. Object photography always opts for multiple views and close-ups. In printed publication form this approach has to be reconciled with expense and space limitations. Plans for the Tovish videodisc called for multiple views and real time footage of some objects. The question of how many views of an object adequately presented a full documentation and understanding warranted experimentation.

4.3. Final design decisions, production, and the computer interface

4.3.1. Shooting the documentary

Tovish's studio is a room 30' by 60' with large skylights. It is ideal for shooting during the day. During the 18-month shooting period no lights were needed. Shoots always occurred during the daytime, the time when Tovish worked and was willing to let us into his studio. The audio was

difficult to record well as the studio was next to train tracks and in an industrial area of trucks and machinery.

Shooting the video documentary section of the videodisc extended from the spring of 1987 to the summer of 1988. In all 19 hours of tape were recorded. All of the footage was recorded on a 3/4" portable video tape recorder with a 3 tube Ickegami camera and a short Sennheiser shotgun microphone. Most of the camerawork was handheld with an occasional tripod shot if the situation warranted. The style was always cinema-verité with a small crew, usually myself on camera and one other person tending the video recorder and handling the microphone. The shotgun solved our sound problems as long as it was reasonably close and the train was not going by.

Shirley Veenema did the majority of the sound work as well as being a real collaborator in deciding choice of subjects and questions and later in defining the material and making the edit. Martha Swetsoff served as an occasional sound and camera person. She was especially instrumental at the beginning of the shoot because she has known Tovish and his wife since she was a child when her father was Tovish's art dealer in Boston. Her close relationship helped peel away some of his protective armor. Bernice Schneider recorded sound on a number of occasions and did a few stints with the camera. Her aggressive manner in getting the shot from close proximity was a foil to my more safe distance style. Tovish had made movies in the 1960's and was very aware of the camera. Occasional shifts in the camera person's style nudged him off balance and gave a bit of an edge to some of his responses and actions.

As we worked with Tovish it became evident that he was going to give a complete portrayal of himself as an artist but he was not going to allow access to many aspects of his personal life outside the studio. Thus, the initial design plans changed to include primarily shooting with him in his studio as he worked and planned for the exhibition. The style of making the documentary and allowing things to happen in front of the camera (Leacock) meant the filming took time. An occasional question directed Tovish's responses, but the path of the material was Tovish's choice.

However, we were committed to no stiff, predetermined viewpoint of who Tovish was and what he meant. In contrast to essays and written

material, here was Harold Tovish talking about himself and his work.

Shooting the documentary involved the following main avenues:

- 1) Tovish talking about his art and artistic process, his life history both personal and artistic, his connections to art history and politics, the human condition and art, his techniques and methods of working and the techniques of sculpting and drawing in general
- 2) The technical processes of casting a head in bronze, including the steps of mold making, wax casting, laying up the wax, heating and pouring the bronze and chasing and finishing the casting
- 3) Tovish working, following the construction of one of his installations pieces including trips to the carpentry shop, ceramic facility and the different stages of construction
- 4) Tovish's personal life, primarily footage shot with his wife Marianna both at her studio and at home
- 5) Demonstrations Tovish arranged for the videodisc

4.3.2. Making the Catalogue of Works

Sculpture

The design strategy called for a complete visual database of the sculpture shot specifically for the videodisc. Black and white photography for the printed catalog was done simultaneously. Many of Tovish's pieces from his forty year career are in museum or private collections. These pieces had to be photographed by others or arrive well before the exhibition so they could be photographed in the Addison Gallery's studios.

Unfortunately many of the photographs made by others were unusable in terms of visual quality. Often only one overall view was sent back because the directions we sent detailing how to photograph the multiple views were not followed. Whenever we could get permission from other institutions, work was photographed for the videodisc. If work arrived one month before the exhibition and before the transfer of slides to tape it was shot in multiple views. Those pieces which arrived too late were represented by a single view on the videodisc for the exhibition. After the show opened multiple views were photographed for inclusion on the final release copy of the videodisc.

Tovish destroyed many of his pieces over the years. Luckily he was a good photographer and recorded most of the "lost" pieces. Though mostly black and white they at least existed, even from the earliest days. He obviously knew as a young man the importance of keeping track of his work and his history. Even if not completely successful, a work is still an important record of process.

Tovish has very specific ideas about the heights for viewing his sculptures. We photographed from this preferred height, but the expense and time involved in photographing each piece necessitated choices of both how to "look" at each piece and how many views to photograph. Bronze, the main material Tovish used, is exceedingly difficult to photograph well. Reflection causes unnatural highlights and modeling details are often difficult to render in the shadow areas. The exposure range must be limited or else both ends of the exposure curve are lost in transfer to video. As with the Muybridge stills, we knew the details of the transfer process. (See addendum) This meant high quality photography on 35mm positive stock could be done with bracketed exposures and experimentation as to ordering views.

There were three main approaches to shooting the still shots of the sculpture.

- 1) Some pieces, as for example *Passage, 1964-65* were shot with one overall view and then a series of closeups. (Fig. 4) When viewed in order on the videodisc, the work in its entirety is shown in the first view. In the next three shots, the viewer seems to approach the sculpture and examine the details. Sculpture which had a definite backside was shot in this way.
- 2) Many of the pieces were adequately presented with a small number of views. *Ceremonial Axehead, 1975* and most of the bas-reliefs were shot in this manner with two views. (Fig. 5) *The Victim, 1950* was shot in the three different positions Tovish intended for this piece. (Fig. 6) Two views of each position were considered adequate to show this piece on the videodisc.
- 3) The majority of Tovish's sculpture was meant to be seen in a completely 3-dimensional way. These were shot with either four or eight views, sometimes with additional closeups of details. When viewed on the videodisc the user has the sensation of

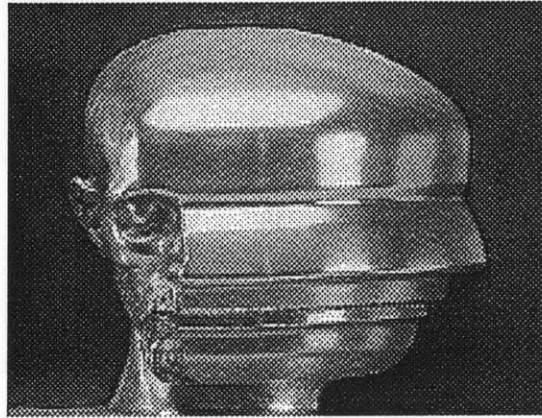
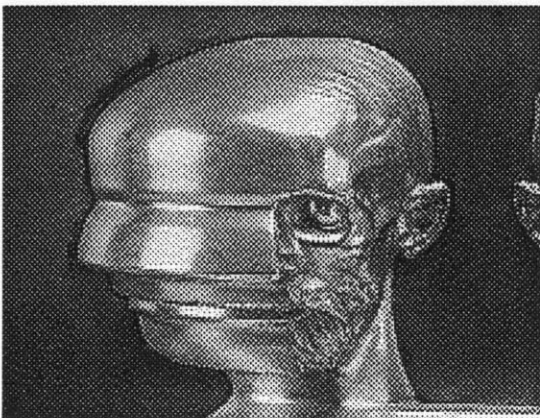
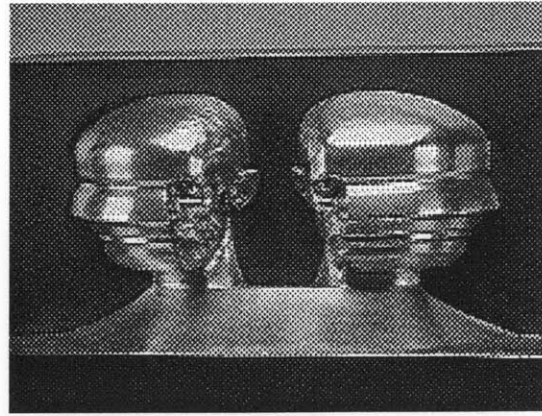
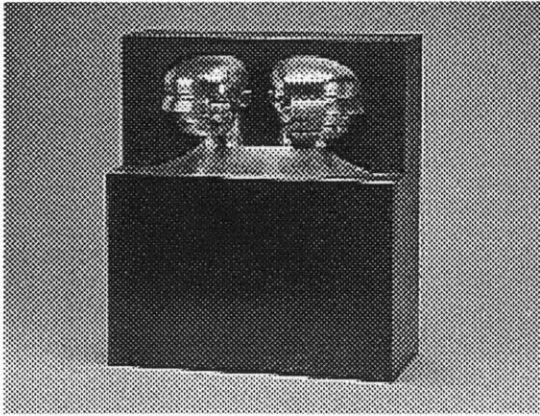


Fig. 4 Harold Tovish
'Passage', 1964-65
bronze relief; edition of 2, 40 x 34 9/16 x 16 1/8"
Hirshorn Museum and Sculpture Garden, Smithsonian Institution

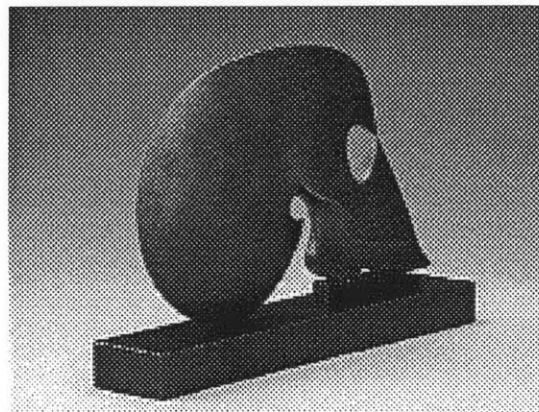
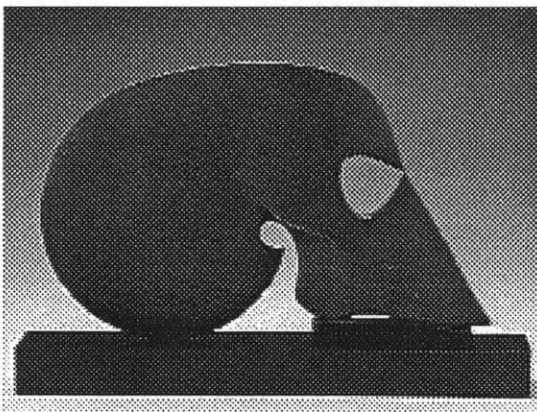


Fig. 5 Harold Tovish
'Ceremonial Axehead', 1975
bronze; unique
7 3/16 x 11 7/16 x 11/16"
Private Collection

both from 'Harold Tovish: Sculptor' videodisc

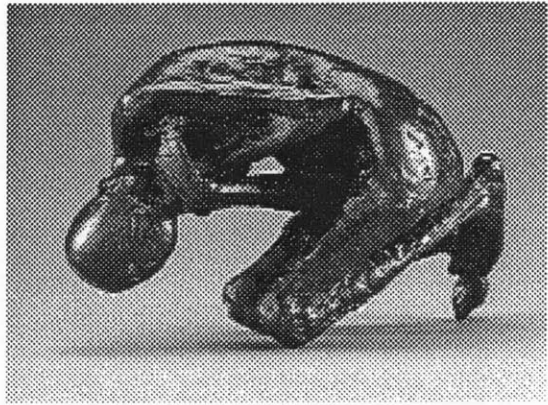
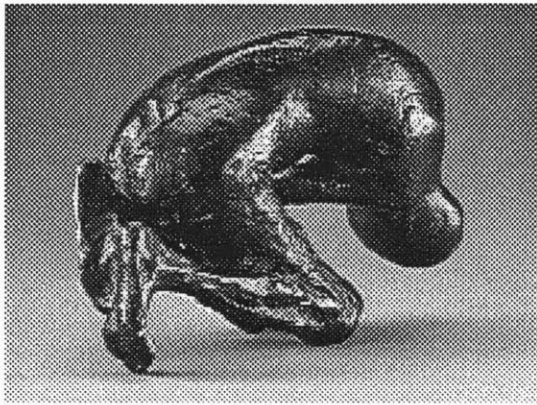


Fig. 6 Harold Tovish
'The Victim'
bronze; edition of 3
5 1/4 x 11 x 7 1/8"
Phyllis B. Davis

from 'Harold Tovish: Sculptor' videodisc

walking around a large piece or holding a small piece in one's hand. Viewing on the videodisc is not smooth, but this very abbreviated form of moviemapping was deemed adequate given the high cost of personnel and the shortage of space on the videodisc. The *Unit of Measure* sequence heads were the only pieces photographed to display a full motion treatment.

Prints & drawings

Tovish is a prolific draftsman. He often does hundreds of drawings a year, most of which are "thought" sketches. Although he has kept very few of these sketches over the years, he had some. Others were available on loan to the exhibition, to be photographed or both. Single views and details of most of the drawings sufficed. Tovish had not done much culling of his recent hand sketches so a sampling of this most recent and active part of his work was photographed. We recorded video sequences which show him drawing and talking specifically about these drawings and the relationship of drawing to his sculpture. We also recorded a sequence of him modeling a hand out of clay from the bare armature to an almost complete work. Although this piece ultimately was destroyed, it was exciting to have this visual record of how Tovish worked.

The prints which Tovish made since 1969 were all available and in some cases, available in multiple states. There were two series of approximately the same sized plates. A simple copy stand arrangement was adequate to shoot an overall shot and some details.

Installation pieces

The installation pieces are recognizable on slides, but a sense of the space they occupied and the way they change the space they occupy cannot be conveyed in stills. These pieces were shot in real time video after they were installed. They were not on the videodisc which accompanied the exhibition. On the final release copy of the videodisc, these pieces will be included along with an audio track detailing their meaning and political significance.

Shooting the Unit of Measure sequence

Tovish began investigating the self portrait at the end of the 1960's. His first works were a series of prints, drawings and bas-reliefs. In 1974 he made an exact scale, realistic bust of his own head using the direct plaster technique. 83 metal pins implanted in the plaster delineated the reference points Tovish used for measurement and conversion from his own head. Over the next four years Tovish completed a set of 14 other heads using the original plaster as their unit of measure. Norman Keyes, Jr. writing in his catalogue essay for the Addison exhibition states the series, *Transformations From A Unit of Measure* is considered "in effect a summary statement that would enable him in the round to recapitulate and reassess the major phases of his development with the human head." This series is "his most inventive undertaking proceeding from the premise that content determines form" (Keyes).

From the beginning of the videodisc project I wanted to treat Tovish's *Unit of Measure* series of heads in a fashion which would allow the viewer see the quality and relationships within the series. My idea was to imitate as much as possible viewing the heads as if actually walking around each one. The viewer approaches the head, goes behind it and then looks closely at the surface details and modeling. At first I considered using a moviemapping approach. Three reasons factored against moviemapping. The expense of building and devising the necessarily precise shooting arrangement was beyond our budget. A two videodisc player system was necessary for creating a seamless feeling of motion during playback. This was outside the general design parameters of the project which specified a simple generic installation. Finally, audio on this section would require another source than one videodisc as slow motion playback on a videodisc player does not play audio. There were solutions using audio coming from either a compact-disc audio player or a second videodisc player but again cost and design parameters decided against their implementation.

Actual shooting took place over a period of three days. The film was shot with concern for consistent lighting and placement using a 16mm camera shooting at 30 frames per second. When transferred to video there was a frame rate match so each video frame was sharp and viewable as a still. Each head was spun on a turntable at exactly the same speed and filmed against a evenly lit plain background. Each shot recorded 2.25

revolutions, 13.5 seconds per revolution. When viewed on the videodisc, the beginning shot starts with a full view from the right side. The head then revolves until it had gone completely after about 1.25 revolutions. During the last revolution, a slow zoom ends with a medium full frontal close-up of the head. (Fig. 7)

4.3.3. The edit

In laying out the videodisc it took time to reconcile cinema vérité and videodisc considerations. In most videodisc manuals the talk is always of extensive pre-planning as to how the videodisc real estate will be assigned. This implies careful coordination of all the parts, particularly planned branchings and interconnection strategies. Videodisc requires a very different editing structure from cinema vérité's emphasis on the material shot directly influencing how the material will be put together. The old dilemma of deciding what narrative thread to use to hold a documentary together was further complicated in the case of the Tovish material which was specifically shot for the videodisc environment. The material had neither script, exact predetermined point of view, nor intricate branching structure that the footage could be matched and cut to.

The one disc player/one disc computer directed system meant a maximum 30 minutes of total time. The non-documentary videodisc real estate included the following visual database: 600 frames for the stills, 5 seconds (150 frames) for "Tenant", approximately 2 minutes (3600 frames) to later insert the installation footage, and an as yet undetermined space for the "Unit of Measure" sequence estimated at 30 seconds per head (900 frames x 15 heads = 13500). Since real time video is 30 frames per second, the documentary could be 20 minutes long. (54,000 frames per side of the CAV videodisc minus the accounted for frames leaves 36,750 or leaving some unused space at the beginning and end of the videodisc, 36,000 frames)

The videodisc had to be as rich as possible and show as many main avenues which Tovish had revealed as could be adequately represented in the remaining 20 minutes. In documentary, the usual maxim for editing is to go with your strongest footage which works together. Harold Tovish as a sculptor was the key. What did he think about what he did, why he made

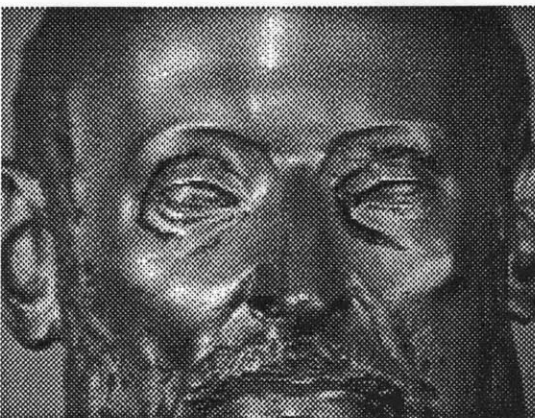
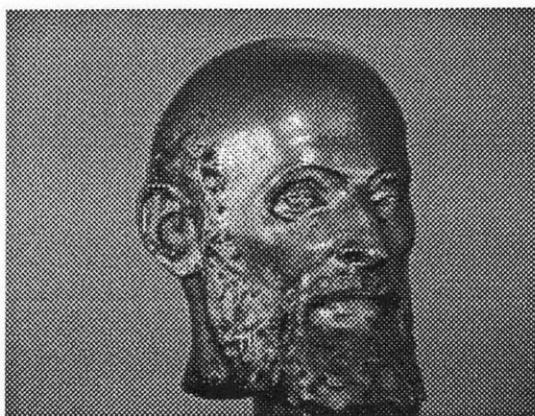
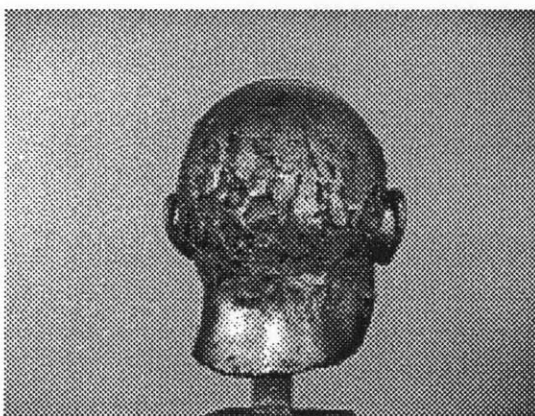
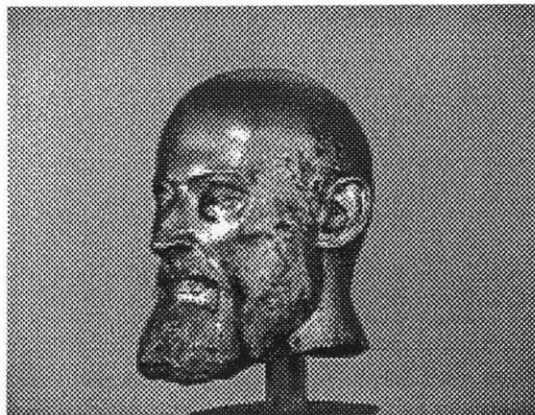
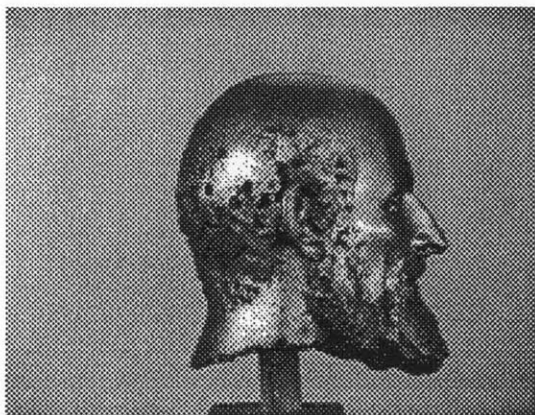


Fig. 7 Harold Tovish
 'A Unit of Measure', 1977
 bronze; unique
 11 15/16 x 8 5/8 x 9 5/16"
 Arthur and Sara Jo Kobacker
 from 'Harold Tovish: Sculptor' videodisc
 shot starts at the upper left and ends at the lower right, sample frames

sculpture, and how he ended up being a sculptor? What were his motivations, his dreams, his memories and his history as they related to being a sculptor? This was the best material we had filmed. Tovish was most eloquent when talking about these subjects. Let that be the documentary, the representation of Tovish as the world would see him on video but with his art either at the exhibition or on in the videodisc.

Twenty minutes was enough to show the core material if all of the technical process material were left out. That could be either used later on the other side of the videodisc or handled in graphic and text screens on the computer. Once this decision was made, determining what to include focused on selecting what were the core material's most important ideas and subjects when seen in conjunction with the other parts of the videodisc.

In cutting a program for videodisc my own philosophical viewpoint is to make editing decisions based on an open and constantly evolving system of information access. For a filmmaker an interactive movie means giving up control of the order in which a film is viewed. Each sequence or chunk can be viewed in a number of different ways and the material accessed from a number of different points of view. The computer interface for a videodisc must pay attention to present technology but also look to future delivery systems which are sure to be more powerful, better designed and with access to increasingly large amounts of information. During both the Tovish and Muybridge exhibits the design of the interface governed the amount of control given viewers. Once in distribution, schools, other museums and individuals can develop different means of accessing the videodisc.

The Tovish edit exemplifies this process of decision making for the videodisc arena. We recorded Tovish working on a handful of different pieces and Tovish talking about many. As in cutting any film it made sense to choose segments because of their relationship to the artist's work, the strength of the visuals, and how well a segment would cut with the other sequences. Additionally because the Tovish material was meant for videodisc, all the interconnections had to be taken into account. This included links to parts of the documentary sequences, to specific areas within the visual database, and to information which could be found as text or graphics located within or accessed by the computer interface.

In making a non-videodisc documentary, one might weave shots of the artist working on a piece with shots of the finished or of related pieces and mix the sync sound with the artist's voice over the art work. One could edit a similar sequence and yet double the impact for the real estate on the videodisc by laying down different sound tracks on channel 1 and channel 2 and using the interface to access one or the other. Now the picture must function adequately for two different soundtracks. This can present difficulties in editing but two benefits enrich the sequence. First, one can keep the visual centered on the process because the accessible visual database included elsewhere on the videodisc can show any related material the audience needs to see on demand. Secondly, two audio tracks mean that it is possible to deliver twice as much audio information.

The opening sequence of the documentary section is a good example of how one can put together a sequence for videodisc. The visual content is Tovish sculpting a hand in clay from bare armature to an almost finished state. The audio one track is a voice over of Tovish telling his early personal history as an artist. The audio two track is Tovish describing the two modes of working he has pursued during his career. The user can see any of the works Tovish refers to by going to the catalogue of works and investigating by date and medium. In the release version of the videodisc and software, a style or mode reference will be added as well as a collection of Tovish's family photographs to also accompany audio one track.

In videodisc, the chunks must be intelligible if they are accessed without the preceding or succeeding shots or sequences. All sequences must have a continuity of meaning. Documentary filmmakers traditionally attain smoothly flowing sequences through bridging audio and picture with "l-cuts" and/or cutaways. If the introductory or establishment shot is taken away the following shot can become meaningless. The same can be said of audio especially in the case of narration.

In making the final edit list I decided to make a movie which worked in both linear and interactive modes. Initially I had planned an interactive movie which could be viewed in a linear mode only by using computer control to do the sequencing. The shift in the final edit was governed by two factors. One, I wanted the videodisc to have distribution as a level I release. Two, my training and experience as a filmmaker was in making linear movies. My sense was the Tovish material could be cut as a linear movie

and still work well in an interactive mode if very careful attention was paid to all of the considerations I describe in the preceding paragraphs.

In keeping with my analogy of the chunks, I conceived of the entire 20 minute documentary as the biggest chunk made up of a series of smaller chunks which could be accessed on a sequence by sequence basis. At the same time I placed each chunk in the whole by paying attention to the overall rhythm, pacing and flow of the entire piece. This required a construction which had a clear beginning and introduction, a middle which contained the bulk of the content and an end summation. (See Fig. 8 for sample frames from the documentary.)

4.3.4. The interface, levels, chunky editing, granularity

For the Tovish videodisc, I again opted for a generic computer interface, usable and workable anywhere rather than a specialized hot rod capable of doing many things wonderfully but only able to run on specific hardware with proprietary or expensive software. After the installation of the Muybridge videodisc I was convinced about the merits of Hypercard. Many people were jumping on the Hypercard bandwagon. It did not allow for the creation of an extremely sophisticated multimedia environment but it did work well. I could work with Hypercard's limits. It is neither a true database with a powerful query engine nor will it control two videodisc players or display color. I did not need these functions for my application, and the Muybridge installation proved that Hypercard functioned well in a museum environment. As a tool it had to be improved, but it was a popular product and essentially free running on an inexpensive computer platform.

My main considerations at this time were access to the visual database, the chunks of the documentary section, the text information, and the necessity of interconnecting these parts. With Hypercard I had the ability to make tools adequate to the project's intentions and needs. Tools were constructed to facilitate looking at the catalogue and access the visual database according to medium, date and title using the mouse as a kind of joy-stick to drive through the material. Visitors were able to navigate parts of the documentary by way of a few subject choices.

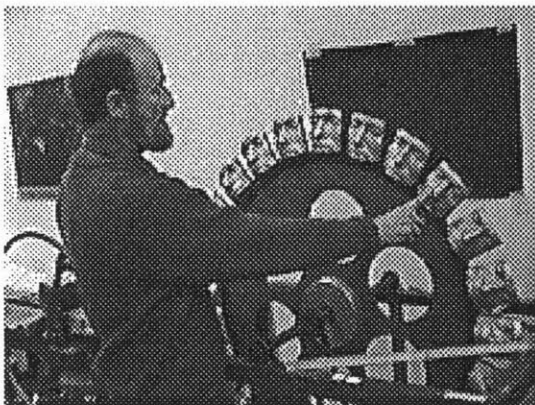
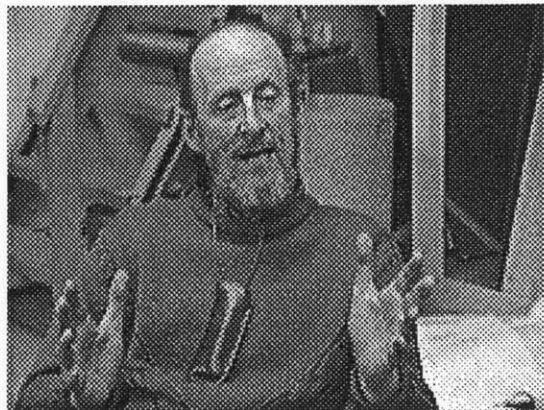
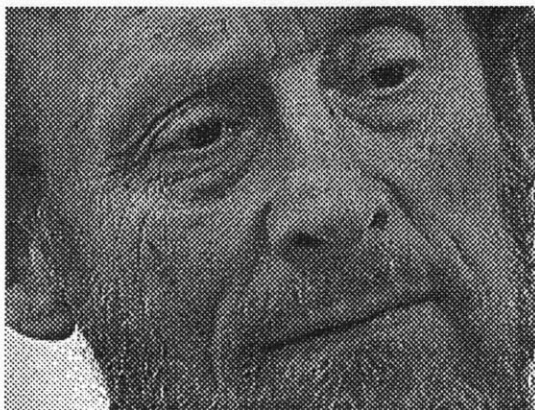
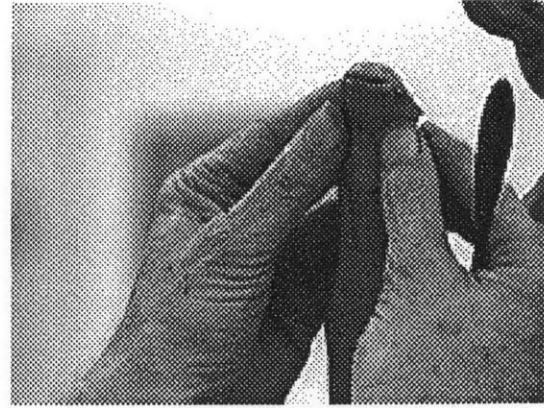
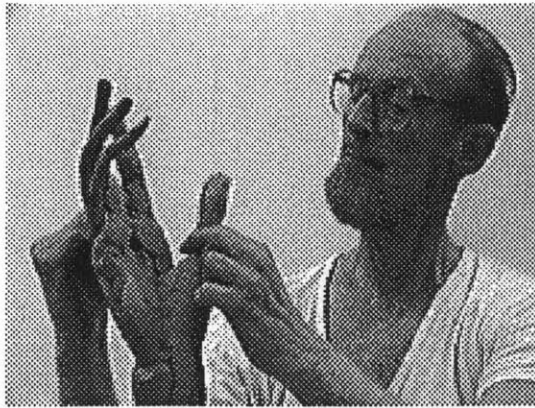


Fig. 8 sample frames of the documentary section
from 'Harold Tovish: Sculptor' videodisc
u.l., u.r. opening sequence m.l., m.r. mentor sequence
l.l. 'Tenant' sequence l.r. drawing sequence

This choice process is in line with my twofold research methods during these two videodisc projects. First, I was investigating interfaces which would run in many possible kinds of environments but particularly museums. Second, I was trying to determine what were the best ways to design and make interactive videodiscs for the museum environment. I was not out to make that hot rod, but at the same time I was able to learn from those who were through my working with groups at Project Athena and Film/Video at the Media Lab developing powerful interactive video workstations. The possibilities for implementing sophisticated database tools for editing, interacting and accessing material were enormous. Graphic components, script, textual data and information could be added with ease and all of these components were capable of running simultaneously in windows on the same screen. Such implementations would work but not for at least a year, and they would only run on an expensive workstations (DEC MicroVaxII with a Parallax video board) in an X-Windows environment.

In its final form for the Tovish material, the videodisc with computer access has four distinct parts: the catalogue, the documentary, the "Unit of Measure" sequence and the textual information. Both within the museum exhibition and in final distribution outside the museum, the documentary is available only by way of the videodisc. On the videodisc, the documentary is available both as a linear movie and as subject chunks. There are approximately 15 chunks within the documentary, depending on whether a few of the sections are later broken up into a finer granularity. Chunks for two specific art sections ("Unit of Measure" and "Tenant") were put at two different access levels. "Unit of Measure" was available at the top level because of its length and importance; "Tenant" was below the documentary level because it was a natural subsection. (See Fig. 9 for videodisc layout.)

Granularity is limited at this level and the user is not permitted to make a new movie by reassembling the chunks. Therefore, it is not necessary to have a complicated database for the documentary material or instructions to the user. Limiting the amount and kind of interactivity available also limited how long a viewer might use the workstation in a totally personal way during the exhibition.

During the exhibit, Tovish's work was available in two different forms. Tovish's work was actuality present and a viewer could browse it in

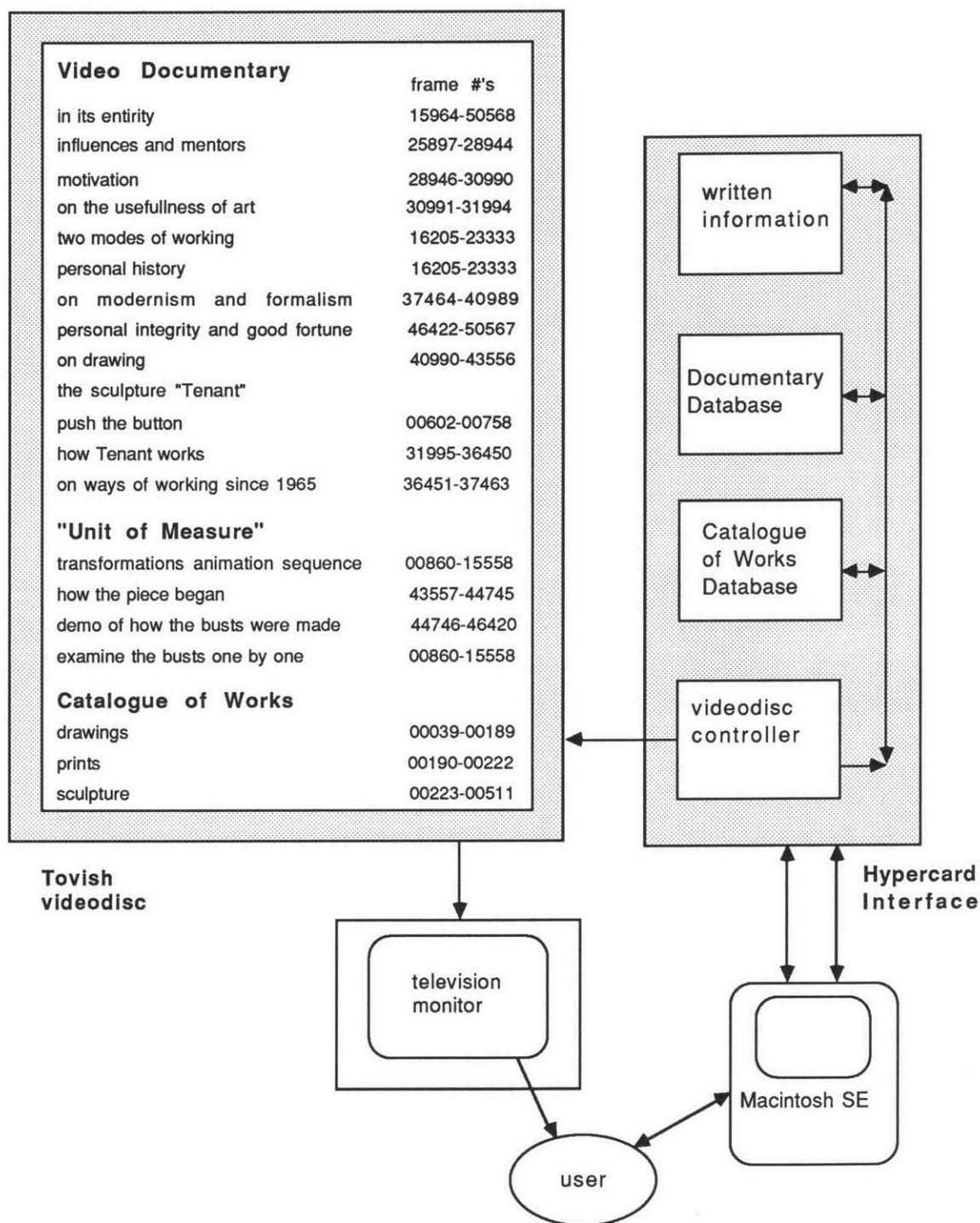


Fig. 9 diagram and frame locations of the *Harold Tovish: Sculptor* videodisc

the exhibition or use the videodisc to browse the database of works. Many more of Tovish's works are accessible on the videodisc than in the exhibition. While no actual work is present after the exhibition, a viewer using the computer interface can browse the work by accessing the visual database. Therefore in designing the visual database, it was important to think as a curator. As in the show, computer access to Tovish's work is organized essentially by title, date, medium, dimensions and lender. Through computer access the same kinds of bridges to the work are available whether one leaves the videodisc to go look at the work or uses the mouse to navigate the work on the videodisc. (See Appendix D for examples of Hypercard screens.)

The experience of actually looking at the work is different from the videodisc view. Nonetheless because the interface tools allow the viewer to imitate the material view, one can walk around a sculpture, move closer, stop and contemplate. Although the still and film sequences each require a different tool, the "naming" of the choices and levels and the users sense of location within the interface's network were designed to be as clear and understandable as possible (Sasnett).

4.3.5. Role of the computer in organizing the exhibition

The museum organized the Tovish exhibition at the same time the videodisc was in production. This entailed locating the desired objects, requesting their loan and photography, transporting them to the Addison Gallery, arranging work in eleven galleries, and properly cataloguing information necessary for the printed catalogue, wall labels and videodisc database. Three essays on Tovish, a bibliography of all the writings by and about him, a biography, his exhibition record and the collections his work appears in were included in the printed catalogue.

There was a large body of information to manage both for the exhibition and for the videodisc. From the beginning of the project all of the information about the art objects was entered in a Hypercard stack. This stack worked as a database for keeping track of transactions and notations relating to each object. Reports of all kinds were generated from it when necessary. The data needed for the print catalogue was generated as a text file and then word processed for inclusion in the stack and for output as

wall labels. For the final videodisc computer program, the stack and the information not meaningful for the interface were deleted. The original stack is still being used to help arrange the return of all of the objects now that the exhibition has closed. (The preceding description is an example of how using the computer increased productivity.)

In addition to keeping track of all the exhibition's details, using the computer eliminated tedious repeated entry of information. Written material was either entered directly on the computer or reformatted for the Macintosh domain. The entire text of the catalogue was organized and detailed as sections with a word processing program and then delivered to a graphic designer as text files. The designer laid out and designed the catalogue with a desk-top publishing program and then transmitted the data to a printer who output camera ready pages. Photographs were treated independently and added as half tone photographs prior to printing

For the exhibit the text files used by the interface were imported into Hypercard from word processing programs. Sections such as the essays and introduction which were not necessary in the museum installation will be added to the release version of the stack. The following material will also be added in final release: all text mentioned in the bibliography, a section on the technical processes of sculpture, and digital images and animations.

4.4. Reactions: what happened when shown

Many people commented that they understood much more about the exhibition because they saw the videodisc. One person even went so far as to say, "I got more out of the video than the show." In another case, two people who had not seen the videodisc cornered a curator and complained that Tovish's work was perverted. She convinced them to watch the videodisc. Upon their return they said, "Now we know what he's trying to say at least, even though we still don't like his work because it makes us so uncomfortable."

A sculptor and close friend of Tovish's commented, "You captured the sense of Red (Tovish's nickname) and connected him to his art in a way which makes people understand what it takes to be a sculptor." Another artist commented, "I really enjoyed playing with the heads, moving them back and forth. Finally here is a way to look at sculpture adequately." One

visitor, a former student of Tovish's, spent two hours working with the videodisc on two successive days. When asked why she worked with the videodisc for such a long time, she answered, "I wanted to discover his whole history of making art. By going back and forth between the documentary and the catalogue of works I was able to get it all figured out, especially the relationship of the drawings. I really liked having access to them. One usually doesn't. All the hand drawings were really great."

One person remarked that she felt that while using the videodisc she was entertaining the group of people who were in the room with her. She said she felt powerful and uncomfortable at the same time. "I was laying my trip on the rest of the folks. I was really having fun zipping around to all the parts of the disc, but perhaps that wasn't what the other 20 people wanted to see. Maybe you should have more of those setups." (See Appendix E for photographs of the exhibition.)

Staff of the Addison Gallery as well as visitors were overwhelmingly positive about using the interactive videodisc in the Tovish exhibition. Videodisc's power as an educational tool was clear. Visitors gained a better understanding about Tovish and his work either by a linear viewing of the videodisc or by using the computer interface for more personalized investigations. The organizational and management aspects of using the computer in conjunction with mounting the exhibition were added benefits. In hindsight, the small staff saw how much more difficult the exhibition would have been without using the computer.

5. Conclusion

The *Harold Tovish : Sculptor* and *Eadweard Muybridge: Motion Studies* videodiscs are examples of interactive media produced for a specific museum environment. These two videodisc projects give some perspective on using interactive media in museums. Specific aspects and details relating to these projects also give guidance for producing both still image and motion sequences of art objects and videodisc documentary

Videodisc is one example of interactive media which are becoming increasingly attractive to museums. How interactive media is designed, produced and used both within the museum environment and outside the museum walls will determine its eventual impact. In designing and producing interactive media, it is important that images be of the highest possible quality. With new technologies, the baseline of the museum experience must still be placing people in touch with the art objects. Just as with any secondary experience of the objects, interactive media runs the risks of poor quality reproduction or of inappropriate interpretation. But unlike methods of reproduction such as slides, films or video, interactive media has advantages because of its ability to personalize the museum experience for an individual viewer's needs.

New developments in technologies like videodisc are changing how museums manage their collections. These tools allow for interrelated collections management, exhibition, research and education operations. Although methods, definition of purpose and perception of audience have changed, museums traditionally have been concerned with both managing their collections and making their collections available to viewers. The Addison Gallery's positive experiences with using videodisc and computers both in cataloging the collections and as part of two exhibition installations are contemporary examples of how technology is changing museum operations.

We do not really know the true nature of interactivity and all it means, but as systems grow this will change (Hooper). At present there is not much material with which to really implement systems on a scale which allows us to see what will really happen, but use of interactive media and a model of technologically interrelated museum operations are certain to have future implications for museums regardless of technical

specifications or configurations. For example with new technological and media demands, will roles of museum staff change? Will more accessibility to art change how we view and think about art and art museums?

Many critics and educators consider art difficult to understand. The many threads to other disciplines and the fact that art is an area where people are given the least formal education often combine to make art into something for an elite group or a leisure time activity (Lee). Interactive technology has the potential to help build educational means to reach not only the knowledgeable elite but the non-elite. At the same time the amounts of available information could be overwhelming. In designing for the museum environment technologies may need to provide an "intelligent teacher" (Wilson). One thing, however, is certain: whatever dimensions this changed museum takes, interactive technologies have implications for the role of museums in a society where information networks will interconnect museums, schools, home and business.

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Appendix A. Technical Production Descriptions

The photographs from the Muybridge volumes and the Tovish 2-d and 3-d artwork were shot with a Nikon F-3 using 55mm and 105mm macro lenses on Kodak EPR 35mm, ASA 64, positive film. The lighting was done using strobes.

The Muybridge animation sequences were shot at The Frame Shop, Newton, Massachusetts on a Oxberry Master series animation stand with an Oxberry 16/35mm camera using an Interactive Motion Control 3565 motion control computer on Eastman 35mm 5247, ASA100, color negative film.

The "Unit of Measure" sculpture sequence was shot with an Aaton XTR 16mm camera, and an Angenieux 9.5-57mm lens on Eastman 16mm 7291, ASA 100, negative film. Lighting was done with a variety of tungsten light sources.

The Muybridge and Tovish film and slides were transferred to tape at the Tape House Editorial Co., New York City using a Rank Cintel Mark IIIC Digiscan 4 Film Recorder, an Amigo color correcter, a Grass Valley special effects generator for matting, an Abacus A62 frame store and a Sony BVH-8200 1" video tape recorder. An additional copy of all the frames stored in the Abacus was made on a Sony digital D-1 video tape recorder.

The Tovish video documentary was recorded with an Ikegami 350 camera, a Sennheiser 415 microphone and Sony 3/4" 4800 video tape recorder. It was edited on Ampex VPR-2 1" video tape recorders.

Appendix B. Description of the Addison Gallery of American Art

ADDISON GALLERY OF AMERICAN ART

Phillips Academy

Andover, MA

HISTORY

"In loving memory of Keturah Addison Cobb this Gallery has been given by a friend."

The friend was Thomas Cochran '90, Phillips Academy's greatest benefactor, and the Addison Gallery of American Art represents his last and most extraordinary gift to the school. In 1930, when Cochran established the Gallery, the idea of an art museum for a secondary school was unheard of; yet for Cochran it was the capstone of his desire to surround Andover students with "all the instruments of culture." To make the museum a reality, Cochran furnished the funds for the building; provided two endowments, for operations and acquisitions; and donated 100 works, spanning two centuries of American art.

Cochran enlisted the assistance of one of America's most prominent architects, Charles A. Platt, to design the two and one half story Classical Revival museum building which houses the Addison Gallery. The Gallery has nine top-lighted galleries on the second floor, five galleries and offices on the ground floor, and storage rooms and hallway exhibition space in the basement. Five of the upstairs galleries are reserved for rotating exhibition of the permanent collection; the remaining galleries present temporary exhibitions throughout the year.

EXHIBITIONS

Guided by Cochran's original goal to "enrich permanently the lives of the students..." the Addison Gallery's exhibition program reflects the Gallery's central concern for education. Exhibitions complement the teaching mission at Andover as well as contribute to the broader education of the public. Among some of the Gallery's more important exhibitions have been the first complete retrospective of the brothers Prendergast (1938);

"Seeing the Unseeable" (1947), later published as A Layman's Guide for Modern Art; "The American Line: One Hundred Years of American Drawing" (1959); "Feelies: a Demonstration of the Nature of Things Perceived through Touch" (1967); "Three Views of the American Landscape" (1976); and the first East coast exhibition of photography by photohistorian Beaumont Newhall (1980).

In addition to producing exhibitions, the Addison Gallery, has, because of its association with Phillips Academy, an active interest in concepts and practices of art education. This interest has resulted in a variety of explorations of the ways museums can extend their educational resources. In the early 1960s the museum under then Director Bartlett Hayes, Jr. established a program of summer workshops that outlined a new approach to arts instruction, emphasizing the "grammar" of vision and its role in general education. In the early 1970s the museum's director Christopher Cook, working in conjunction with the Institute for the Arts and Human Development, Lesley College, Cambridge, Mass., evolved a museum-based art therapy program for institutionalized clients of local mental health care agencies that brought hundred of clients to weekly afternoon class sessions in the museum. The project offered unique opportunities to understand museum resources afresh, resulting in program changes for regular as well as special audiences.

Today Short Term Art Institutes bring students and teachers for all over the United States for intensive art and art education studies. Taught by members of the Phillips Academy Art Department and museum staff, these special courses carry on the outreach tradition of the school and museum to the region and the nation.

The importance of the Addison Gallery collection is recognized throughout the museum world as its works are included in major exhibitions of American art nationally and internationally.

PAINTINGS

By terms of trust, the Addison's collections are limited to American art. While the painting collection is the smallest in number, it includes our most illustrious works. Built on the core donated by Thomas Cochran at the founding of the Gallery, it contains major holdings of the work of Winslow Homer, Thomas Eakins, Maurice Prendergast, Arthur B. Davies,

and Abbott Thayer. The collection is given depth and range by the paintings of anonymous artists and those whose names are yet to be rediscovered, by modest studies and large canvases, by primitive portraits and autobiographical contemporary works.

WORKS ON PAPER AND PRINTS

Nearly a third of our collection consists of works on paper and prints. Some of these works directly complement our painting collection. Other works on paper, such as the watercolors, drawings, and prints of Winslow Homer, allow us to represent the full range of the artist's accomplishments. For others the works on paper, both watercolors and prints, represent some of the most important work by the artists.

PHOTOGRAPHY

Photography is the largest of the Gallery's collections. Making its first acquisition of work by Margaret Bourke-White in 1934, the Gallery has recognized photography from the start. At present, the collection has grown to represent the full range of photography. The Gallery's holdings of the work of Eadweard Muybridge, which includes both the complete volumes of *Animal Locomotion* (1887) and a rare volume of *Attitudes of Animals in Motion*, rivals those of other major photography repositories. The emphasis on photography, and the related media of video and film, is testament to the Gallery's commitment to the integration of artistic expression in its collections.

OTHER COLLECTIONS:

The Addison houses a collection of ship models which trace the evolution of American shipping from Mayflower prototypes to steam. A small but important collection of sculpture parallels other collections at the Addison.

The museum is open to the public free of charge.

excerpted from the *A Guide to the Addison Gallery of American Art*,

Appendix C. Videodisc Credits

Eadweard Muybridge: Motion Studies

22 minutes, color, silent

Produced and Directed by James Sheldon

Film Animation: Ed Joyce
 Ed Searles
 Jana Odett
 The Frame Shop
 Newton, MA.

Film-to-Tape-Transfer/
Video Animation: John Dowdell
 The Tape House Editorial Co.
 New York, N.Y.

Still Photography: Betsy Evans
 John C. Lutsch
 Leslie Maloney
 James Sheldon

The interactive computer programming is in HyperCard by Apple Computer, Inc.

Eadweard Muybridge: Motion Studies videodisc and Hypercard stack
© 1987 James Sheldon and Addison Gallery of American Art

Harold Tovish: Sculptor

30 minutes, color, audio 1&2

Produced and Directed by James Sheldon
Assisted by Shirley A. Veenema

Camera: James Sheldon

Additional Camera: Bernice Schneider
 Martha Swetzoff

Sound: Shirley A. Veenema
 Bernice Schneider
 Martha Swetzoff

Still Photography: Elizabeth W. Crawford
John C. Lutsch
James Sheldon
John D. Woolf

Production Assistance: Silas Cook
Susan Faxon
Leslie Maloney
Juliann D. McDonough

Film-to-Tape-Transfer: John Dowdell
The Tape House Editorial Co.
New York, N.Y.

Produced at Film/Video, The Media Lab, Massachusetts Institute of Technology, with special thanks to Glorianna Davenport and Ricky Leacock.

Partially Funded by a Grant from the Abbot Academy Association

The interactive computer programming is in HyperCard by Apple Computer, Inc.

Harold Tovish: Sculptor videodisc and Hypercard stack
© 1988 James Sheldon and Addison Gallery of American Art

The *Harold Tovish: Sculptor* and *Eadweard Muybridge: Motion Studies* videodiscs with accompanying Hypercard stacks are distributed by The Voyager Company, 1351 Pacific Coast Highway, Santa Monica, CA., 90401.

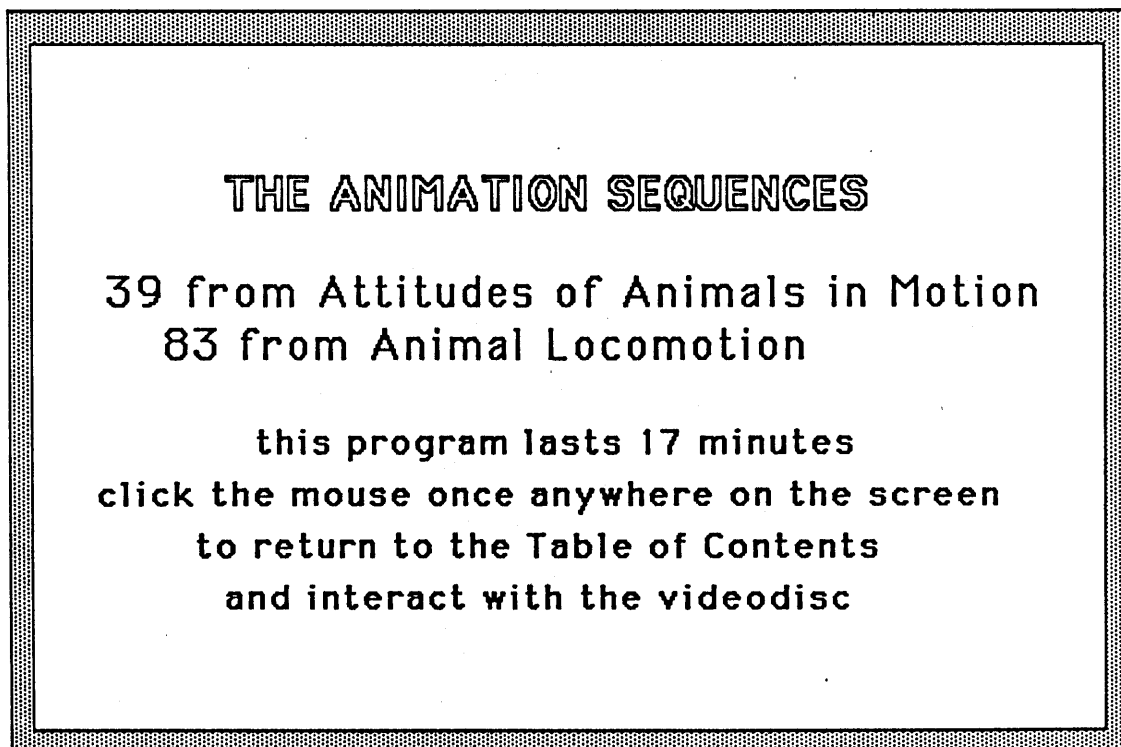
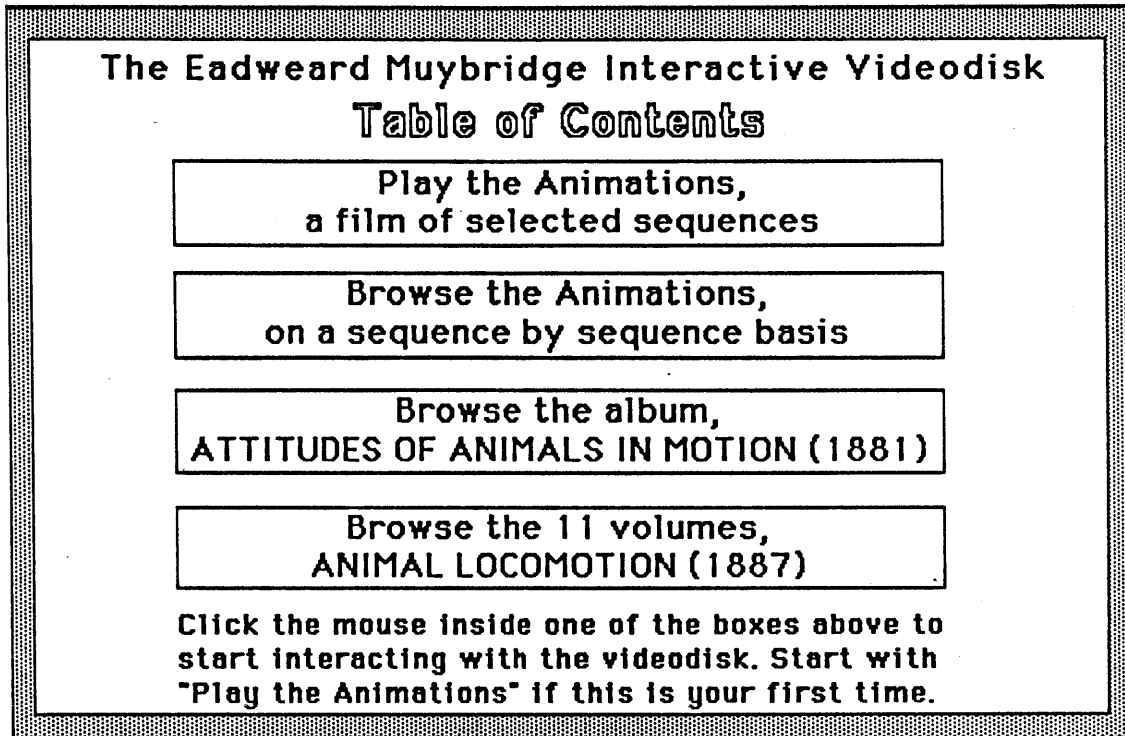
Addison Gallery Staff

Director: Christopher C. Cook
Assistant Director/Registrar: Nicki Thiras
Curator of Paintings, Prints, and Drawings: Susan C. Faxon
Curator of Photography: James L. Sheldon
Membership/Public Relations: Juliann D. McDonough
Preparator: Leslie Maloney
Curatorial Secretary: Adeles Teves
Guards: Richard Caldwell
Frank Maguire
George E. St. Jean
Custodian: Mary Caron
Preparation and Installation: Northern Artery, New Hampshire

The Addison Gallery is a Department of Phillips Academy

Appendix D. Example Screens from the Hypercard Stacks

Eadweard Muybridge: Motion Studies Videodisc



The Individual Animation Sequences

Index to the animations

from ATTITUDES OF ANIMALS IN MOTION

- | | |
|---------------------------------------|---|
| <input type="radio"/> Horses | <input type="radio"/> Foreshortenings |
| <input type="radio"/> Various Animals | <input type="radio"/> Skeleton of Horse |
| <input type="radio"/> Athletes | |

from ANIMAL LOCOMOTION

- | | |
|--|--|
| <input type="radio"/> Males (Nude) | <input type="radio"/> Misc. Subjects |
| <input type="radio"/> Females (Nude) | <input type="radio"/> Abnormal Movements |
| <input type="radio"/> Males (Pelvis Cloth) | <input type="radio"/> Horses |
| <input type="radio"/> Females & Children | <input type="radio"/> Animals |

Click the circle or anywhere in the type
of the section you want to view.

← Return to
Table of Contents

The Animation Sequences

Attitudes of Animals
in Motion

Plate No. 35

Horses, Trotting,
"Occident"

Length of Stride 18' 9"

Play at
Normal Speed

Play at
Slow Speed

Next
Sequence

← Step →

Volume
Index

Previous
Sequence

← Browse
Sequences →

To view the sequences click the mouse in the
indicated action. Browse is stopped by clicking
the mouse again.

← Return to
Table of Contents

The Attitudes of Animals in Motion

Index to the plates

- ☐ Introductory Illustrations (No. A-F)
- ☐ Horses (No. 1-73)
- ☐ Various Animals (No. 74-91)
- ☐ Athletes (No. 92-118)
- ☐ Foreshortenings, Horses (No. 119-190)
- ☐ Foreshortenings, Athletes (No. 191-193)
- ☐ Skeleton of Horse (No. 194-203)

Click the circle or anywhere in the type
of the section you want to browse

← Return to
Table of Contents

The Attitudes of Animals in Motion

Plate No. 103

Athlete, Running High
Leap

Length of Stride 4'

Next
Plate

Previous
Plate

Volume
Index

← Browse
Plates →

To view the plates click the mouse in the
indicated action. Browse is stopped by clicking
the mouse again.

← Return to
Table of Contents

Animal Locomotion

Index to the plates

- Vol. I Males (Nude)
- Vol. II Males (Nude)
- Vol. III Females (Nude)
- Vol. IV Females (Nude)
- Vol. V Males (Pelvis Cloth)
- Vol. VI Females & Children
- Vol. VII Males & Females & Misc. Subjects
- Vol. VIII Abnormal Movements
- Vol. IX Horses
- Vol. X Domestic Animals
- Vol. XI Wild Animals & Birds

Click the circle or anywhere in the type
of the volume you want to browse

← Return to
Table of Contents

Animal Locomotion, Vol. VI
Females (Semi-Nude) &
Children

Plate No. 97

Turning to ascend stairs,
with a pitcher and goblet
in hands

Intervals in 1/1000 sec. 161

Next
Plate

Previous
Plate

Volume
Index

← Browse
Plates →

To view the plates click the mouse in the
indicated action. Browse is stopped by clicking
the mouse again.

← Return to
Table of Contents

Harold Tovish

Sculptor

an interactive videodisc presentation

Table of Contents


Video Documentary about Harold Tovish	Catalogue of Works	Unit of Measure Sequences
Written Catalogue Information		Help with using the videodisc

Click the mouse within one of the boxes above to interact with the videodisc.

The Video Documentary about Harold Tovish

Documentary in its entirety	This video documentary was made over the last two years with the artist at his Cambridge, MA studio. The documentary is 20 minutes in length. You can select to view it from beginning to end by choosing the box on the left or in segments by choosing one of the boxes below.	
Return to Table of Contents		
influences and mentors	two modes of working	the sculpture Tenant
Tovish's motivations	personal history	on drawing
on the usefulness of art	on modernism and formalism	personal integrity and good fortune

Tenant



Tenant

**how Tenant
works**

**on ways of working
since 1965**

In Tenant,...the image of man is actually mechanized, his head seeming to take shape in a moving lathe. The image, in fact, is a sculptural film turned by an electric motor. The head (based on a life mask of Hyman Bloom) appears through a window located at eye level within a black box standing six and one half by four feet. The viewer presses a door bell, and twenty four heads placed on a revolving wheel meld in a flickering film sequence. Norman Keyes, Jr. Tovish (Andover: Addison 1988)

The sculpture Tenant of 1964-1965 is recreated in video. Push button at top left.

 **Return to
Table of Contents**

Transformations from A Unit of Measure


**Transformations
Animation Sequence**

**"How the piece
began" Sequence**

**Demonstration of how
the busts were made**

**Examine the busts
one by one**


Click within the area you
want to view.

 **Return to
Table of Contents**

"[Transformations from A Unit of Measure is]...the major series of busts that Tovish undertook from 1977 through 1979, demarcating sections of the head in terms of a point system. The sculptures that emerged were based on 83 points identified on the head with calipers according to contours.....he attempted something highly personal and extensive, in effect a summary statement that would enable him in the round to recapitulate and reassess the major phases of his development in terms of the human head....The series has been his most inventive undertaking proceeding from the premise that content determines form." (Norman Keyes, Jr. essay in Tovish catalogue.)

Help and General Information

This video disc has been designed to allow viewers to access images by and information about sculptor Harold Tovish. This disc consists of a number of distinct bodies of information, including a short film of the artist at work, a complete inventory of works, and documentation of the artist's career. The documentary of the artist at work discusses with the artist his background, motivations, sources, and philosophies. The catalogue of works can be viewed chronologically, by medium. Also on the disc are images of lost and destroyed works, as well as works not included in the exhibition. There are several animated sequences, specifically for Tenant and the 15 works comprising Transformations from A Unit of Measure, accessible in both the catalogue of works and the separate Unit of Measure sequence. The written information section includes biographical information, exhibition history, bibliographical references to the artist and his work, and public collections containing his works.

 **Return to
Table of Contents**

Reference Information


Biography

Exhibition Record

Credits

Public Collections

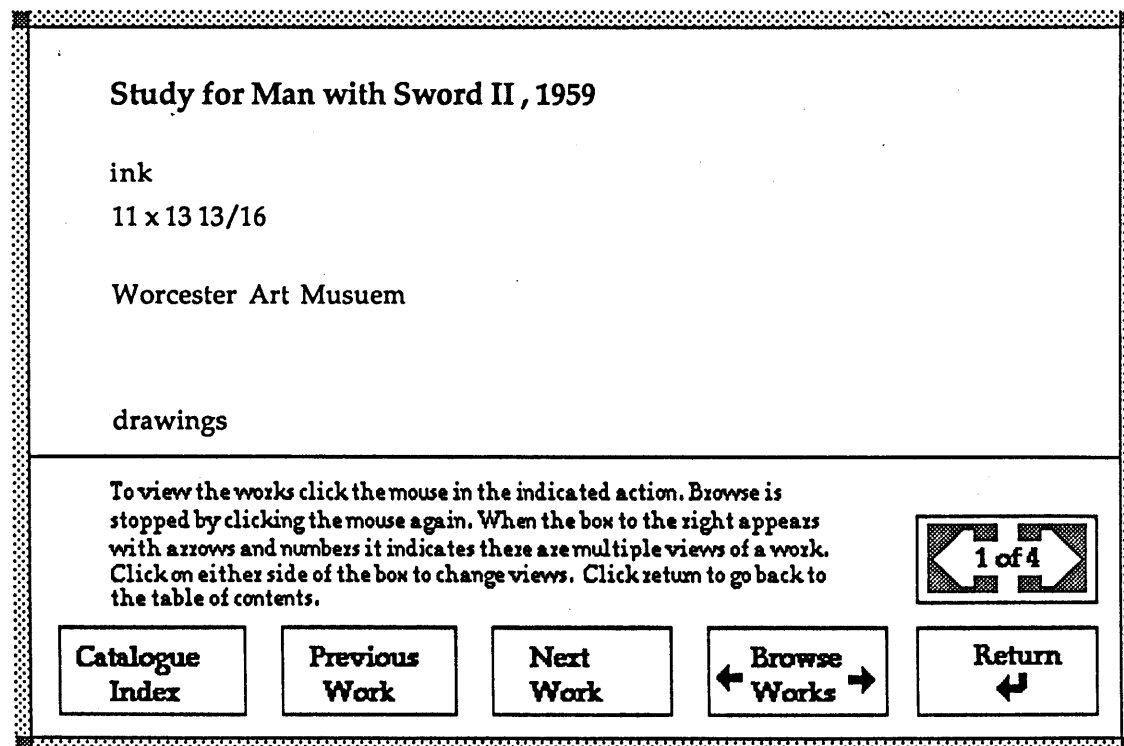
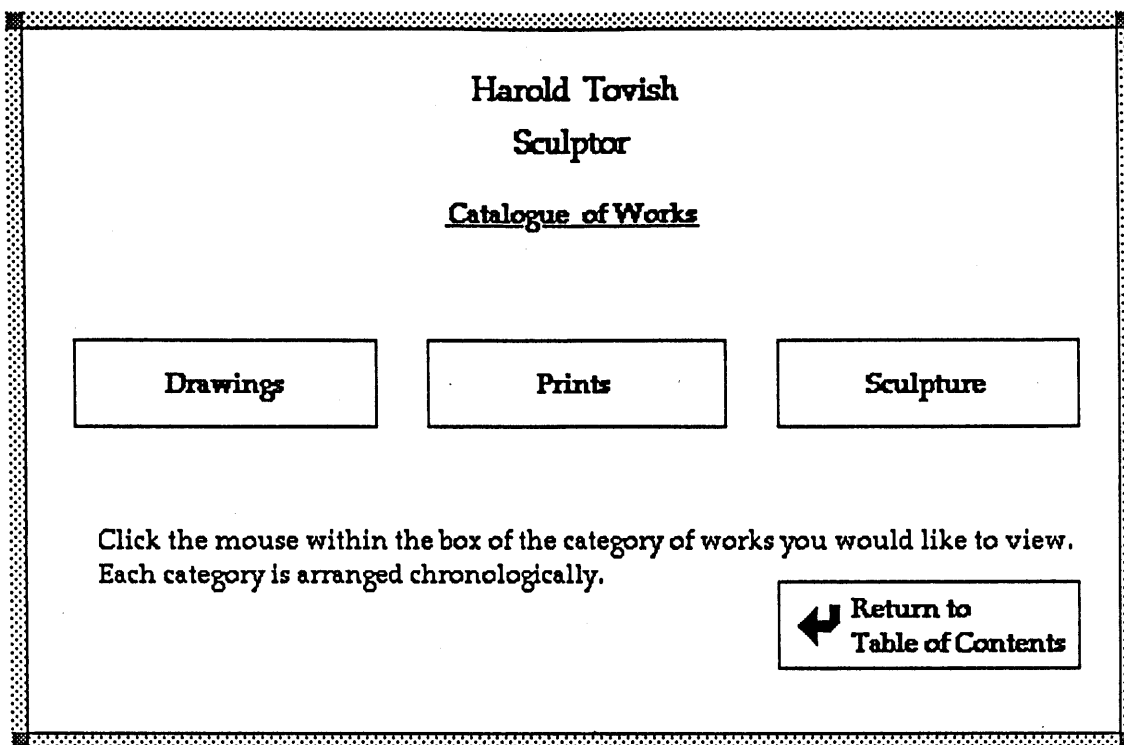
Bibliography

 **Return to
Table of Contents**

The choices on this card will allow you to study various aspects of the career of Harold Tovish. Click the mouse within the box of the area you would like to look at. Click the mouse in the Return to Table of Contents box when you are done.

Drag the square in the scroll bar at the right in the direction you would like to go within the text. Or you can click the arrow at the top or bottom of the scroll bar to move quickly up or down the field of information, release the mouse when you are at the point you want to read.





Harold Tovish: Sculptor Videodisc

A Unit of Measure , (1977)

bronze; unique
11 15/16 x 8 5/8 x 9 5/16
o.h. 11 15/16
Arthur and Sara Jo Kobacker

Move the mouse within the rectangle below to control the direction and speed of the rotation of the head. Take the mouse out of the rectangle to stop the head from turning. When you get to the end of the segment the video will jog and then stop, move the mouse in the opposite direction to get the head moving again. Try it.

« Fast Norm Slow « Step » Slow Norm Fast »

Catalogue Index Previous Work Next Work Browse Works Return

Passage , 1964 - 1965

bronze relief; edition of two
40 x 34 9/16 x 16 1/8

Hirshhorn Museum and Sculpture Garden, Smithsonian Institution. Gift of Joseph H. Hirshhorn, 1966.

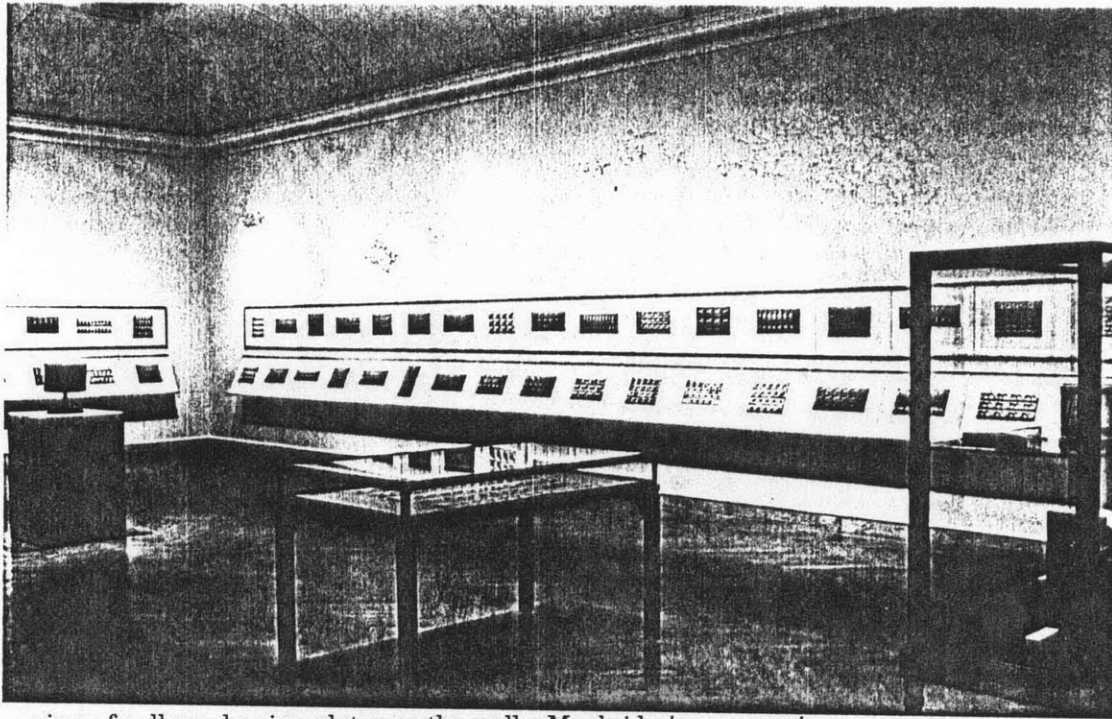
sculpture

To view the works click the mouse in the indicated action. Browse is stopped by clicking the mouse again. When the box to the right appears with arrows and numbers it indicates there are multiple views of a work. Click on either side of the box to change views. Click return to go back to the table of contents.

1 of 4

Catalogue Index Previous Work Next Work Browse Works Return

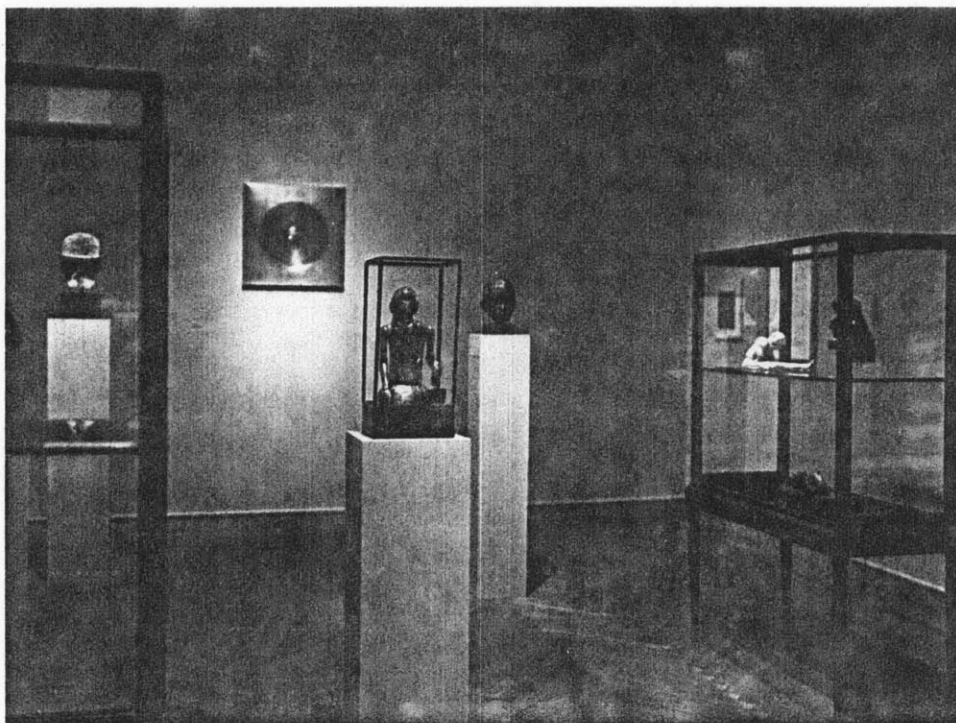
Appendix E. Installation Photographs of the Exhibitions



view of gallery showing plates on the walls, Muybridge's cameras in the case on the right, zoetrope strips in center case, zoetrope on the left



front gallery with videodisc installation, rear gallery with "Attitudes of Animals in Motion" in case and on walls both from the exhibition "Eadweard Muybridge: Motion Studies", October 16, 1987 - December 13, 1987, Addison Gallery of American Art



(top) exhibition gallery
(bottom) videodisc installation)

from "Harold Tovish: A Retrospective Exhibition 1948-1988"
October 21, 1988 - January 8, 1989, Addison Gallery of American Art

